SPECIAL EatingWell EDITION

Anti-Aging

Stay Sharp, Energetic and Healthy

What to Feed Your Brain

Eat for Gorgeous Skin

The Healthy-Aging Diet

How to Live Past 100

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Contents

4 A Path to Healthful Aging

CHAPTER 1

A Long, Healthy Life

12 The Real Secrets to a Long Life
18 Living Longer on Healthy Soil
26 Eating for Your Genes
32 The Healthy-Aging Diet

CHAPTER 2

Power Your Mind

38 What to Feed Your Brain
46 How to Outpace a Stroke
48 Look on the Bright Side

CHAPTER 3

Lasting Radiance

54 12 Foods for Younger-Looking Skin
60 The Collagen Question
62 One Size Does Not Fit All

66 **7-Day Meal Plan for Glowing Skin**

CHAPTER 4

Active at Any Age

78 Walk Away from Father Time
82 Frail Old Lady? No Way
84 The Truth About Protein

88 **Recipes: Dinner in 25 Minutes or Less**

96 Eat Smart, Stay Sharp

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INTRODUCTION

A PATH TO HEALTHFUL AGING

Research shows that diet—and other lifestyle factors—can play a big role in keeping you sharp, energetic and youthful. Read on to find out how to add years to your life, and life to your years.

BY JOYCE HENDLEY, M.S.

Once upon a time, living to a ripe old age was merely a possibility—if you were lucky. In truth, most of us didn't make it much beyond our reproductive years; as late as the 1890s, the average life expectancy in the U.S. was just around 45. But major advances in medicine and public health have expanded that to an average age of 78 (and that includes the recent one-year drop due to COVID). The number of centenarians worldwide is predicted to climb to 3.7 million by 2050.

Our understanding of aging, too, has evolved dramatically. We used to think of it as an inevitable descent into debility and disease, except for those lucky few who were blessed with "good genes." (Think: Tom Brady.) Today, it's known that genetics account for only 20 to 25% of our longevity, and much of how we age is determined by epigenetics—that is, the effect that environment, diet and other lifestyle choices, many of which are within our control, have on the way our genes work. (Again, think: Tom Brady.) Biological age, in other words, is not the same as chronological age.

Researchers are now focusing less on the number of birthday candles on the cake and more on our "health span"—extending the number of years we can live free of the infirmities we associate with aging, from a foggier memory and creaking joints to a weakened immune system and greater risk of cancer. Rather than chalking up those indignities to "just getting older," experts are looking at them as largely preventable and sometimes even reversible. "We don't have to accept misery and frailty as a 'natural' part of old age," says molecular biologist David Sinclair, Ph.D., codirector of the Paul F. Glenn Center for the Biology of Aging at Harvard Medical

School and author of the provocatively titled *Lifespan: Why We Age—and Why We Don't Have To.* He believes that aging is primarily a function of problems reading the information—the genetic code—in our cells, and that epigenetic disruption is a key driver of that process.

Sinclair and other researchers are looking at ways of reprogramming those cells. Recent studies he has conducted in mice have shown that it's possible to restore cells' ability to read those genetic instructions, a process he likens to polishing the surface of a scratched CD to retrieve the stored information—the music—inside. In this case, Sinclair and his team were able to make the eye cells of old mice "younger" and reverse vision loss.

We're still years away from turning findings like this into a medical reality for us humans. "But we already have plenty of tools to help us maximize our vitality along the way," says *EatingWell* advisor David Katz, M.D., M.P.H., founding director of Yale University's Yale-Griffin Prevention Research Center and co-author of *How to Eat: All Your Food and Diet Questions Answered.* "The most important elements are lifestyle practices and having a healthy, supportive environment."

And when it comes to lifestyle habits, experts are pretty unanimous that what we choose to eat is central to aging well. An overall healthy diet that

includes what Katz calls the usual suspects—fruits, vegetables and other plant-based, whole foods—is important.

But the foods on the following pages are rich in compounds and nutrients that are particular anti-aging heroes. Other factors, such as regular exercise, sleep and stress management, are also associated with better aging.

Researchers at Harvard's T.H. Chan School of Public Health recently reviewed decades of data from more than 123,000 participants and concluded that those who maintained certain healthy patterns in adulthood—eating a good diet, exercising, keeping weight under control, not drinking too much alcohol and not smoking—were able to add significantly to their projected life spans, with women gaining an average of 14 years and men picking up 12 years. Best of all: most of these habits are eminently doable, if not downright pleasurable (eating!).

What Is Aging, Anyway?

Time passes and we all get older, but it's clear that aging isn't only a function of time. Just attend a 20th or 40th high school reunion and you'll see a vivid tableau of how those decades seem to be kinder to some than to others.

Indeed, when it comes to the changes we associate with aging, the World Health Organization notes that "a gradual decrease in physical and mental capacity [and] a growing risk of disease . . . are neither linear nor consistent, and they are only loosely associated with a person's age in years." Aging is actually a series of changes at the molecular level in our cells, and experts say that how well we age is largely dependent on how healthy these microscopic body parts are.

When our cells divide and new ones replace the old ones, the DNA in their chromosomes is copied, supplying the vital instructions that make them function as they should. Capping the ends of our chromosomes are telomeres—segments of DNA that help protect the precious genetic material inside and keep it intact during this process, akin to the way the aglet on the end of a shoelace prevents it from unraveling.

As our cells replicate, telomeres tend to get smaller. Eventually, too-short telomeres send out chemical signals that trigger cells to stop dividing. Some die off, while others become senescent—less able to follow their genetic instructions, work properly and fend off disease. When senescent cells build up over time, our body's tissues start to age.

Turning Back Time

The good news is that this process isn't all one way: research has shown that telomeres can actually lengthen, thanks to an enzyme called telomerase, the availability of which controls whether these DNA caps shrink, hold steady or grow after certain cells divide. And lifestyle factors like a healthy diet can keep them robust. "The better we can preserve telomeres in healthy cells, the better our chances of a longer health span," explains molecular biologist Patricia Opresko, Ph.D., a professor of environmental and occupational health at the University of Pittsburgh and UPMC Hillman Cancer Center.

Proof of this concept was first demonstrated in a study led by Dean Ornish, M.D., a professor of medicine at the University of California, San Francisco and founder of the Preventive Medicine Research Institute (PMRI). Ornish's plant-based diet and

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A SNACK BOARD LOADED WITH PLANT-BASED BITES IS A FUN WAY TO WORK IN TELOMERE-PRESERVING VEGETABLES.

lifestyle program, which includes things like moderate daily exercise and stress management, is best known for reducing—and sometimes reversing—the course of heart disease, but this research looked at prostate cancer patients. His team discovered that disease progression was significantly slower among those on the Ornish plan. And a follow-up study in another group of men with early-stage prostate cancer found that those who adhered most closely to the regimen had, on average, a 10% increase in the length of their telomeres after five years. By contrast, a control group that didn't follow the diet and lifestyle interventions had telomeres that became 3% shorter over the same period. The findings were some of the first to show "a very promising potential for individuals to change their lifestyle and have more control over how they age," notes Carra Richling, senior registered dietitian at PMRI.

Cooling "Inflammaging"

How can our eating habits and behaviors have such a profound effect? Namely, by regulating levels of inflammation in our bodies—a process so closely linked to the development of age-related diseases that researchers have dubbed it "inflammaging."

First, some background: inflammation is the way our bodies respond to challenges like infections and injuries, activating the immune system to fight off invading pathogens. But this healing process can become dangerous if it's chronic—causing quiet but persistent damage to our cells that shrinks telomeres and speeds the march to mortality. Nearly all major health conditions—from Alzheimer's and diabetes to cancer, hypertension and heart disease—are linked to chronic inflammation, which is responsible for more than half of all deaths worldwide. And our risk for developing it tends to increase as we age.

The Food Factor

A major contributor to inflammaging is oxidative stress, or the production of so-called free radicals in the body that damage cells, including our telomeres. Research in Opresko's lab found that high levels of oxidative stress can speed the shortening of telomeres. But a plant-rich diet that includes plenty of vegetables, fruits and whole grains can "protect and preserve your telomeres in a natural and healthy way," Opresko explains. The antioxidants they contain act as an off switch to the oxidation-inflammation process by neutralizing free radicals and breaking the chain of reactions that leads to cell damage. That may be one reason the oft-lauded, plant-centric Mediterranean diet and DASH eating patterns have been tied to both lower rates of inflammation and longer telomere length.

Equally important as what you eat is what you don't, including red and processed meats, like sausage and cold cuts. Both are sources of pro-inflammatory compounds and have high amounts of saturated fat, which lead to the production of chemicals that can tip the immune system's balance in an inflammatory direction, says Katz.

Other inflammation stokers are foods with refined carbohydrates, such as white bread and pasta, and added sugars. They cause insulin spikes that negatively affect the immune system. Sugary sodas are especially potent inflammagers: an *American Journal of Public Health* study of 5,300 participants found a link between soda consumption and shorter telomere length—and that each daily 8-ounce serving was associated with nearly two extra years of cellular aging.

When it comes to lifestyle habits, experts are pretty unanimous that what we choose to eat is central to aging well.

Recent studies also implicate ultra-processed foods, like chips and fast food, with higher levels of inflammation and shorter telomere lengths. A Spanish study of 886 seniors showed that those who consumed the most ultra-processed foods (3 or more servings a day) had almost double the odds of having short telomeres compared with those who ate the least (less than 2 daily servings). Why? These foods deliver pro-inflammatory nutrients we already get too much of—salt, added sugars, refined carbs and unhealthy fats.

Sticking to a more plant-based, whole-food-rich diet is a recommendation we've all certainly heard before. But that is the point, experts say. It's a proven way to live better now, and it also happens to provide the best insurance for a longer and happier health span. ●

CHAPTER 1

A LONG, HEALTHY LIFE

Staving off the aging process begins with protecting yourself from chronic ailments. Here are the secrets behind the science of living longer.

THE REAL SECRETS TO A LONG LIFE

Surprise: The chance that you'll be able to place the 100th candle on your birthday cake is mostly in your control. For real. Here's how to stack the odds in your favor.

BY HOLLY PEVZNER

Any time local newscasters interview the latest neighborhood centenarian, they always ask the same question: What's your secret to living such a long life? The answers, however, are all over the map. Is it the daily glass of red? The after-dinner walks? The gals and gossip from Sunday bingo? The truth is, you can't boil the key to longevity down to one magic soundbite to share with the morning news team. That's not to say that we have no control over our life spans. We do. In fact, "for the majority of us, genetics only account for about a quarter of our ability to reach a very old age, which puts lifestyle choices in a large role," says centenarian researcher Stacy L. Andersen, Ph.D., an assistant professor at Boston University School of Medicine. For instance, cigarette smoking shaves an average of at least 10 years off your life, regardless of your genetic makeup. But quitting before you turn 40 reduces your chance of succumbing to smoking-related disease by roughly 90%, notes the Centers for Disease Control and Prevention.

While disease avoidance is certainly a big part of longevity, it's not the only thing. "Centenarians also maintain good physical and cognitive function into their 90s and beyond, allowing them to remain active and engaged throughout their lives," says Andersen. Never has this longevity sweet spot of staying well and disease-free been more apparent than in the five pockets of the world with the highest life expectancy: Ikaria, Greece; Loma Linda, California; Nicoya, Costa Rica; Okinawa, Japan; and Sardinia, Italy, famously dubbed the blue zones. When researchers examined the local diets and habits of these areas, they found several common threads. "It's all about a collective lifestyle, not a strict diet

100

or workout regimen," says Dexter Shurney, M.D., executive director at the Blue Zones Institute. The best part? You can make blue-zone-inspired lifestyle changes in midlife and still garner a significant longevity advantage, notes a 2016 report in the *Journal of Epidemiology & Community Health*. Researchers found that lifestyle changes alone could reduce mortality by up to 69%. "It goes to show that small changes can really have an impact. And when you start to feel better, you can make bigger changes and add on," says Shurney. Here are eight routes to a longer life.

Up Your Fruits and Veggies

"Centenarians eat a wide array of garden and green vegetables, herbs and fruit," says Shurney. "There's extensive evidence on the health-promoting effects of a primarily plant-based diet." The latest: a large-scale 2021 report in the journal *Circulation* found that consuming about two servings of fruit and three of vegetables a day is likely the optimal amount for a longer life. In the study, Harvard researchers found that five-servings-a-day folks had a 12% lower risk of death from cardiovascular disease, a 10% lower risk of death from cancer and a 35% lower risk of death from respiratory disease when compared with those who ate just two servings a day. "This isn't that surprising," says Shurney. "Look at it like this: Plant foods on average have 64 times more antioxidant power than meats and dairy. And antioxidants are necessary to protect the body from free radicals, which cause illness by damaging our DNA." While variety is key to getting a healthy mix of nutrients, Shurney notes that plants with deeper and brighter colors tend to have the most antioxidants. In addition, the study found that green leafy vegetables, such spinach and kale, and fruit and vegetables rich in beta carotene and vitamin C, such as citrus, berries and carrots, showed the most longevity benefits. (Starchy veg like peas, corn and white potatoes weren't linked to aiding long life.)

Rethink Meat

"We've known for a while that the more red meat in your diet, the greater your risk of chronic disease and early death," says Kristin Kirkpatrick, R.D., owner of KAK Nutrition Consulting and nutrition consultant at Cleveland Clinic Wellness Institute in Ohio. Thanks to a 2019 report in the journal *Nutrients*, we know that even small amounts can have a negative impact on life expectancy. When compared with vegetarians, people who ate roughly 2 ounces of meat a day (that's about half a burger) were 26% more likely to die from cardiovascular disease, according to researchers. The association stuck even after adjusting for other risk factors, such as smoking and drinking. The good news is that decreasing the amount of red meat you eat while increasing healthy meat alternatives is associated with a lower mortality risk, notes a 2019 study in the *BMJ*. Some of Kirkpatrick's favorite meat-for-plant swaps are legumes, quinoa, whole grains, nuts and seeds, and whole soy, such as tofu and tempeh. Making these types of trades has big benefits—even when doing so in midlife, according to a 2020 study in *JAMA Internal Medicine*. Here, researchers found that middle-aged folks who shifted just 3% of their caloric intake from animal protein to plant protein experienced a 10% decrease in all-cause death over a 16-year span. When researchers zeroed in on those who swapped eggs and red meat for plant proteins, they found that their risk of death was lowered by up to 24%. Of note, the long-lived people in the blue zones eat red meat twice a week at most, in serving sizes that equal no more than 2 ounces cooked. At the same time, up to 3 ounces of fish is enjoyed daily.

Move Naturally

You know what's not a must-have in blue zones? Gyms. It's not that those who achieve long life are inactive. Instead, they tend to move about every 20 minutes, according to Shurney. The key here is that they're decidedly not sedentary. "Being physically active is about reducing sitting time by adding movement to your day," says Sabrena Jo, director of science and research at the American Council on Exercise. "And while being physically active doesn't necessarily result in things like bigger muscles, it absolutely results in improved health, and it positively impacts longevity." A study in the *British Journal of Sports Medicine* found that reducing the amount of time you sit throughout the day can increase good cholesterol, reducing the risk of cardiovascular disease—and lowering risk of

REPLACING HALF THE GROUND BEEF IN A DISH WITH BEANS IS A GREAT WAY TO WORK IN MORE FIBER.

all-cause mortality. And that's regardless of regular exercise. To work more movement into your life, Jo suggests pairing a physically active task with a common behavior that you already do in your day. "For example, while waiting for your coffee or tea to brew each morning, do some feel-good stretches in your kitchen; or while you're brushing your teeth, alternate standing on one leg; or each time you have a phone conversation, stand up and walk around your house or walk around the block," says Jo.

Eat More Beans

Beans and legumes are unique in that they're both a vegetable and a protein (aka, a meat alternative). Legumes have been dubbed "the most important dietary predictor" of longevity by the National Ageing Research Institute in Melbourne, Australia, so they get a special shout-out. After all, "beans and legumes, including fava, black and soy beans, chickpeas and lentils are the cornerstone of centenarian diets," says Shurney, noting that those who live in blue zones eat ½ to 1 cup of beans daily. "Nutrient-dense beans are a fantastic plant protein source, which we know helps with longevity. And they're also fiber-rich," says Kirkpatrick. "Fiber, which is also found in fruits, vegetables and whole grains, is associated with a better gut microbiome, which can play a role in disease prevention." You prevent disease, you live longer. Case in point: folks who ate the most fiber experienced a 15 to 30% decrease in all-cause and cardiovascular-related death when compared with those who ate the least, suggested a 2019 meta-analysis in the journal *Lancet*. The longevity bull's-eye seems to hover between at least 25 and 29 grams (or more) of dietary fiber a day.

Make Your Grains Whole

You can't really talk about the longevity benefits of fiber without mentioning whole grains, such as amaranth, barley, old-fashioned oats, quinoa and 100% whole-grain bread. (Blue zoners favor 100% whole wheat, rye or pumpernickel; sprouted-grain bread; and traditionally made bakery sourdough over ultra-processed white bread.) Beyond fiber, however, "whole grains contain numerous bioactive compounds and essential nutrients, like magnesium and polyphenols. They all work together to help lower risks of many chronic diseases, including diabetes, heart disease and stroke," says Kelly Toups, R.D., director of nutrition at Oldways, a nonprofit food and nutrition education organization. "So it's no surprise whole grains are a blue zone staple." After all, a 20-year study involving more than 100,000 people published in *JAMA Internal*

Medicine found that those who regularly ate whole grains had a 9% lower overall death rate and a 15% lower death rate from heart disease.

Keep Good Company

After a year-plus of COVID-19, the world has realized that seeing friends and family is key to one's mental health. It's also key to longevity. In 2018, Cigna Health researchers found that loneliness had the same impact on one's chance of dying as smoking 15 cigarettes a day. "We know that people who are socially isolated have higher rates of cancer, heart disease and heart attacks than people with more social connections," says Shurney. "This makes the lack of social support and connection a major public health issue." On the flip side, research in *Perspectives on Psychological Science* found that close relationships and socializing are two of the most important predictors of a long life. While, yes, there's nothing you can do about lockdowns and quarantine, you can still prioritize connections. The National Institute on Aging recommends scheduling time each day to stay in touch with family and friends. If it's safe, plan regular walks or in-person chats. Alternatively, bookmark a specific time of day to email, text, call or Zoom with others.

Change How You Eat

There's a 2,500-year-old mantra that those in Okinawa often say before enjoying a meal. It's "Hara hachi bu" and it essentially means, "Stop eating when you're 80% full." "That doesn't mean stop eating if you're still hungry," clarifies Toups. "Instead, it's about recognizing that hunger and fullness are on a spectrum, and you not being completely full doesn't necessarily mean you're still hungry." For people who aren't used to honoring their hunger and fullness cues, "it can take time to differentiate between the sensations of being ravenous, having gentle hunger pangs, feeling neutral, being satisfied, being full and being absolutely stuffed," says Toups. But it's important, since ignoring that 20% gap between just-right and stuffed is why many people overeat, which can lead to longevity-sapping obesity. A 2018 study in *JAMA Open Network* found that being obese was tied to a 27% increase in the odds of dying within the 24-year study period. "Some strategies to help recognize when you're at 80% are to eat more slowly, set your fork down between bites, and be mindful and present during your meal," says Toups. (That means no eating while distracted.) Another approach: dine with friends and family. "If you're eating with others, you're nurturing your social network, connecting with others, which helps relieve your stress. And you'll probably eat slower too," says Shurney.

Reduce Processed Foods

It turns out that 86% of the food products Americans buy are classified as ultra-processed, according to a 2019 report in the journal *Nutrients*. "Ultra-processed" encompasses such middle-aisle nutrient black holes as snack foods, sweets and salad dressing. And all of this offers zero favors for our longevity. "For starters, these foods are highly palatable, so you're less likely to be able to control portions and recognize hunger cues to limit overeating," says Kirkpatrick. "When it's hard to control portions, the risk of becoming overweight and obese goes up, which consequently comes with its own set of comorbidities." Also, ultra-processed foods are more likely to contain ingredients that have been associated with increased risk of cardiovascular disease and some cancers. A 2019 report in *BMJ* found that indulging in four or more servings of ultra-processed foods a day is associated with a 62% increased risk of all-cause mortality compared with less than two servings a day. And for each additional ultra-processed daily serving, mortality risk increased by 18%. While it's hard to let go of all the convenience, Kirkpatrick suggests starting by cooking more at home.

"Centenarians will always report a wide range of 'secrets' to their longevity—from a bite of chocolate every day to working hard to their religious beliefs," says Andersen. "But no matter what, we know that people with healthy habits, such as engaging in daily physical activity, eating a plant-forward diet and avoiding smoking, live on average 10 years longer than the standard U.S. life expectancy." So in the end, the real "secret" is this: Appreciate your life by treating your body and mind well. "And find meaningful ways to savor all of it," says Andersen. ●

The Snowbird Secret

Move over, blue zones—enjoying wintery retirement days may be the key to staying young for life.

BY CARI SHANE

For the past 14 years, 73-year-old Walter Heske has been living his dream: wintering in Summit County, Colorado, an idyllic land of ski resorts and small towns 70 miles west of Denver. "While my friends from home are heading to warmer climes, I choose to head to the snowcapped mountains," the Long Islander told *EatingWell* in January 2020. Every January, Heske meets up with dozens of friends to kick off his 50-plus days of skiing. "My friends and I never talk aches and pains, and we're all smiles when the snow is falling."

There's a reason Heske and other self-proclaimed "true snowbirds" flock to this area: "To be active and healthy forever," said Jeanne Belli, 77, who lives in Colorado year-round and hit the slopes 101 days last season. And science shows that these seniors are on to something. The Institute for Health Metrics and Evaluation, a research center at the University of Washington, reports that this area of Colorado has the highest average longevity in the U.S.—nearly 87 years.

People here age so well for several reasons. First, they're always on the go, even during the winter, when others—of any age—choose to hunker down. The research linking exercise with a longer life continues to pile up. In one study published in the *British Journal of Sports Medicine*, researchers measured the activity levels of men 71 years and older and kept tabs on them for five years. Those who accumulated 30 minutes of moderate-to-vigorous exercise every day saw their risk of early death decrease by one-third. (It's worth noting that the Summit County folks also tend not to smoke, overeat or drink heavily.) Second, there's the social aspect. For these people, being active is as much about the camaraderie as it is about a 50% lower risk of early death. One explanation is that having supportive relationships reduces stress and the negative effects it has on heart health and immune function.

Bill Sanders, 80, regularly cross-country skis and walks with a group of buddies. He's incredulous that anyone would ask why he's so active: "Being in shape, eating well—these are things that you do if you want to feel good." And if you think it's too late to pick up a snow sport, know that Sanders started skinning when he was 78: he and his buddies ski up the mountain wearing special boots and bindings and skis with extra traction, climbing 2,000 feet to the top of Copper Mountain, Keystone or Arapahoe Basin in about two hours. It's a serious workout! (It's important to talk to your doctor before starting any new fitness routine.)

"You know that old story about the little engine that could?" Sanders asked, laughing. "You get halfway up and it's, 'I think I can, I think I can.' And then you get closer to the top and it's, 'I know I can.' I trick myself." But the real trick, according to the seniors of Summit County, is to just keep moving.

LIVING LONGER ON HEALTHY SOIL

Just as you have a microbiome, the soil beneath your feet has one too. And promising new research suggests it may have a surprising influence on food and human wellness.

BY MICHAEL BEHAR

It's late December 2019 in Boulder, Colorado, and I'm on the University of Colorado campus walking toward the Cooperative Institute for Research in Environmental Sciences (CIRES) lab. The native flora here is dormant, in a deep winter slumber, rendering the landscape in monochromatic tans. Almost nothing is growing outdoors.

That's not so inside CIRES, where billions of microorganisms are thriving. At the lab, Noah Fierer, Ph.D., a professor of ecology and evolutionary biology, introduces me to two graduate students who are hunched over workbenches, using pipettes to transfer batches of live bacteria from glass vials into a machine that will sequence their microbial DNA. In a nearby walk-in cooler, petri dishes are stacked on wire shelves—bacteria being cultivated for ongoing studies—along with a 12-pack of craft beer chilling on the floor. "You're not supposed to see that," Fierer quips.

As a preeminent soil scientist, Fierer is cited in scholarly journals perhaps more than any other researcher in the field. His efforts are focused on organisms that reside in the so-called rhizosphere, the topmost soil layer where plant roots interact with microscopic organisms, among them viruses, bacteria, fungi, protozoa and algae. It's a motley community, collectively termed the "soil microbiome," and it functions as the lifeblood of plants—promoting germination, stimulating roots, accelerating growth and bolstering resistance to disease.

Experts believe that these soil microbes could also have a big impact on the nutritional content of our food. Moreover, the plants we eat and the dirt we come in contact with may directly fortify

our own gut microbiomes. The discovery of this link between soil health and human health has commanded the attention of everyone from big food companies and farmers to scientists and environmental organizations—and has sparked a research boom that may soon tell us whether soil microbes are as important to our longevity as daily exercise and a restful night's sleep.

It's Not Just Dirt

The rhizosphere is habitat to a complex ecosystem that scientists call the "brown food web." At its foundation is the soil microbiome, which is involved in numerous processes that promote and sustain plant growth. Some microbes, for instance, act like stomachs, digesting and decomposing organic matter into nutrients that nourish plants. Another action involves mycorrhizae, silk-like fungi that form vast spindly webs that can span several miles underground. These filaments are like the internet of the soil microbiome, facilitating communication between plants. Experiments have demonstrated that when predators, such as aphids, attack a plant, it can warn its neighbors—signaling them through the mycorrhizal network—that a threat is imminent. The other plants will then engage their natural defenses, often a chemical produced in the leaves, to help repel the invaders.

Mice experiments have shown that even modest soil exposure can strengthen the immune system's response to pathogens.

Soil bacteria and fungi also work in tandem to make minerals in the ground water-soluble. "And if they're soluble, a plant can suck them up with its roots," explains David Montgomery, Ph.D., a professor of earth and space sciences at the University of Washington in Seattle, and co-author of *The Hidden Half of Nature*, about the soil microbiome. Microbes also enable plants to produce antioxidants. "Other bacteria and fungi partner together to pry things like phosphorus out of the soil and transport them into the fungal hyphae," adds Montgomery. Fungal hyphae form a network of web-like filaments (made of mycorrhizae) that perform a synergistic dance with a plant's roots. As the plant naturally secretes sugars into the soil during photosynthesis—sugars that help nourish the hyphae—the hyphae respond by providing the plant with nitrogen, phosphorus and various other micronutrients, such as copper, zinc, magnesium, potassium and iron. It's an equitable trade because plants—like people—need these minerals to exist.

A damaged soil microbiome, however, can disrupt this process, lowering the concentration of these nutrients in our food and, subsequently, in our diet. And a lot of farmland today has indeed been degraded. Montgomery tells me about studies that have tracked a rapid decline in the mineral content of fruits, vegetables and grains over the past 50 years. One survey reported that zinc in vegetables had plunged 59%, magnesium fell 26% and iron tumbled 83%. A similar analysis, published in the *Journal of the American College of Nutrition*, examined 43 different crops, comparing present nutrient levels to those recorded in 1950 by the U.S. Department of Agriculture (the USDA has been collecting this data since 1892) and found that protein, calcium, iron, phosphorus and vitamins B_2 (aka riboflavin) and C had all dropped markedly. "Mineral deficiency is estimated to afflict more than a third of humanity, causing health problems in both developed and developing countries," he says. "Mineral elements are essential for hundreds of critical enzyme reactions, and inadequate levels have been implicated in a wide range of maladies." These include cardiovascular disease, neurological disorders, anemia, increased risk of infection and depression.

There is disagreement among scientists about whether an ailing soil microbiome is partly or wholly responsible for the nutrient decline. (One explanation is that plant breeds are typically selected for productivity or pest resistance rather than nutritional density.) But there is little debate that conventional farming of higher-yield crops—that is, more plants per acre—depletes nutrients from the soil and saps it of microbes. Use of chemical fertilizers, pesticides, herbicides and fungicides, as well as antibiotics given to animals that then get excreted into the soil, can kill soil microorganisms,

making it harder for plants to extract minerals from it. And monoculture (cultivating the same crop year after year) damages the soil microbiome too. Repeatedly growing corn, for example, sucks up more nitrogen and phosphorus than other crops, eventually starving soil microbes of nutrients they need to proliferate.

Benefits for Mood and Immunity

Dirt is where soil microbes live. But they're also peripatetic, hitching themselves to leaves, infiltrating root systems, entering through stomata (pores that let plants breathe carbon dioxide) and aqueous channels, which transport water and nutrients from the soil into the plants. Inside and out, plants are steeped in microbes, which we ingest whenever we munch on foods like broccoli, berries and lentils. "A single spinach leaf has over 800 different species of bacteria that it gets from the soil and the environment," says Christopher Lowry, Ph.D., a professor of integrative physiology and neuroscience at the University of Colorado Boulder. Once in our intestines, these microbes can fortify the human gut microbiome.

We're also exposed to these bugs through soil itself. The biology at play isn't entirely understood, but studies have shown that people who live and work in farming and rural communities, where they have regular contact with dirt—and the microbes it contains—are more resistant to allergies and asthma, while mice experiments have shown that even modest soil exposure can strengthen the

immune system's response to pathogens, including parasites, bacteria and viruses.

Rob Knight, Ph.D., directs the Center for Microbiome Innovation at the University of California San Diego and co-founded the American Gut Project and the Earth Microbiome Project—which are studying the trillions of organisms associated with humans and soils, primarily by sequencing the DNA of the microbes. He's not sure yet whether there is a direct link between the bugs in dirt and human health and longevity—the science is still emerging—but his research has revealed that people who eat a wide array of fruits and vegetables tend to have a more diverse gut microbiome. And studies suggest that individuals with diseases linked to chronic inflammation, such as obesity, cancer, heart disease, asthma and diabetes, tend to have less diversity.

Lowry, who has been investigating how soil microbes can impact our immune system and even our emotions, agrees: "There is a broad consensus that enhancing gut microbiome diversity is good, even if we don't understand all the reasons why. The safest bet to do that is through consuming a varied diet of plants—and consuming plants frequently."

He points to a questionnaire given to volunteers in the American Gut Project. They were asked how many different types of plants they consumed in a typical week, and then were asked to provide a stool sample for analysis. The fecal data revealed that volunteers with the highest variety of good gut bacteria were also those who ate the broadest range of fruits and vegetables. "When I learned that, I went to Whole Foods, picked out 30 different plants and threw them in a blender," he says.

THE IDEA THAT OUR INTESTINAL BUGS CAN SOMEHOW "TALK" TO OUR CENTRAL NERVOUS SYSTEM HAS BEEN STUDIED FOR SEVERAL CENTURIES.

"Now I have 4 tablespoons every night with dinner."

For the past two decades, Lowry has been particularly interested in a species of microbe called *Mycobacterium vaccae*, common in almost every soil around the world. He and his collaborator, Graham Rook, M.D., a professor of medical microbiology at University College London, wanted to know whether *M. vaccae* was among the gut microbes that could dispatch signals to the brain.

The two scientists conducted experiments in mice, injecting them with *M. vaccae*, which under a microscope look like translucent yellow maggots. "The bacteria activated a very specific subset of serotonin-containing neurons in the brain. These neurons are known to govern emotions, especially depression," Lowry tells me. "People were taken aback by the idea that bacteria from the soil could have antidepressant-like effects." Lowry and Rook published their results in 2007, and a media deluge followed. Here was tangible evidence that microbes from the soil—when introduced into the body—could potentially impact health.

Lowry and Rook continued experimenting, homing in on the biological mechanism responsible for the antidepressive effects. It turns out that *M. vaccae* triggers a kind of emotional armor. "It protects against inflammation in the brain in response to stress," Lowry explains. By 2016, he was able to demonstrate in animal studies that *M. vaccae* could alleviate symptoms in a range of psychiatric disorders, such as stress-induced colitis and post-traumatic stress disorder. Lab rats can be conditioned to react to fear using behavioral training. A mild shock or sudden puff of air is paired with a light; eventually, the rats will flinch when seeing only the light. Once a fear response is established, it can take weeks or even months to undo. "But the rats that received the bacteria extinguished their fear within 24 hours," Lowry says. "It was mind-blowing to me."

Lowry and his colleagues also wondered if *M. vaccae* could mitigate the precipitous mental decline that occurs in about 40% of people who undergo major surgery after age 60. It's called postoperative cognitive dysfunction, or POCD, and it's believed to result from a powerful inflammatory response during and after surgery. They developed a series of cognitive tests to gauge the impact of surgery on aged rats and then inoculated them with *M. vaccae* prior to surgery. "The bacteria completely prevented this cognitive impairment," he says.

So I ask Lowry: Why aren't we all taking *M. vaccae* supplements? Granted, the results need to be replicated in humans. But the short answer is that the strain of *M. vaccae* he studied is not available as a supplement, at least not yet. Like other soil scientists I spoke with, Lowry also reckons that bacteria exhibit strength in numbers—it takes legions of them orchestrating in unison to build a hardy disease-quelling gut microbiome. And it will take more research to tease all that out.

Regenerating Diversity

Humans evolved in lockstep with soil bacteria, which likely explains why our microbiomes

share similar microbial DNA—as well as some of the same strains of bacteria. *Lactobacilli,* for instance, can be found in both soil and humans. Those beneficial probiotic bacteria (present in foods like yogurt) help break down food and release nutrients inside our gut; their role in soil is the same. A 2019 study in the journal *Microorganisms* documented this unique kinship between human and soil microbiomes: "They contain the same number of active microorganisms," the authors noted.

The researchers also analyzed the variety of microbes in humans and soils and found that not only is the diversity of both plummeting—it's occurring at roughly the same rate. They identified several reasons for the decline: our transition from an agrarian society to an industrial one, modern hygiene, and our Western diet filled with low-fiber, highly processed foods. When we changed our farming practices, stopped growing our own food—which involved touching a lot of dirt—and began eating more Big Macs than plants, we fractured the beneficial relationship between ourselves and the soil.

So the focus now is on repairing that relationship. Phil Taylor, who earned a Ph.D. in global ecology from the University of Colorado (Fierer was a member of his dissertation committee) is the cofounder and executive director of Mad Agriculture, a consulting firm that "helps farmers build healthy soil and make money doing it," as he puts it. Taylor suggests I read about the work of Sir Albert Howard, an English botanist who traveled the world during the early 20th century. "He wanted to know whether soil health translates into healthy food," Taylor explains. While Howard couldn't identify the exact mechanism, after visiting hundreds of communities, he had enough anecdotal data to answer the question for himself unequivocally: soil microbes forged a conduit between healthy crops and healthy humans.

These days, Taylor says, "the science is playing catch-up to what some farmers already understand to be true." More specifically, he means that the soil microbiome flourishes best—and conveys the biggest benefit to humans—when farmers embrace a hands-off approach and let the brown web do its job, with little or no external input from things like pesticides and fertilizers. His advice to farmers who hire him generally hinges on time-tested regenerative-farming principles, which increase the abundance and diversity of microorganisms in the rhizosphere. In practice, this entails minimizing plowing, maintaining living roots in the ground year-round (via a cover crop), cultivating a variety of plants and integrating livestock onto the land (because grazing and manure foster soil microbes).

And the science appears to support this approach. A recent review of 56 studies published in the journal *PLoS One* found that soil from farms that

didn't till or use synthetic chemicals and employed practices like cover cropping, biodiversity and crop rotation contained 32% to 84% more microbial mass (an indicator of healthy soil) than that from conventional farms. And research at the Rodale Institute found that oats, peppers, tomatoes and carrots grown on organic or regeneratively managed farms contained 18% to 36% more minerals and antioxidants than their conventional counterparts. (Healthy soil has other benefits, too, of course, such as promoting carbon sequestration and water retention, which can help mitigate climate change.)

Plant-growth-promoting microorganisms, or PGPMs, have also come on the scene. They're part of a newer class of fertilizers called biofertilizers. Think probiotics for dirt, which, as it turns out, is a booming industry, despite the absence of evidence proving which microbes work best. Even so, the notion that a farmer could resuscitate barren soil with a microbial cocktail is not exactly outlandish. Numerous agribusiness startups are pursuing PGPMs, including Boston-based Indigo Agriculture, which has hired Fierer to run a yearlong study to develop a microbial inoculant that can turbocharge crop growth.

Other firms are creating "biotic" fertilizers. Like vitamins for the soil microbiome, biotic fertilizers typically are developed from a type of blue-green algae called cyanobacteria. When cyanobacteria decay, they leave behind carbon, nitrogen and other nutrients that nourish the bugs in the soil and jump-start the microbial life cycle. The same process occurs naturally in healthy soil, just much more slowly.

There are no quick fixes, but there is a real movement underway to undo the damage and bring the bugs back. On my way out of the lab, Fierer shows me two large, framed photos hanging on the wall. The images were taken in 2017 in Antarctica; he and his research team spent two months there collecting soil samples from exposed ground in the Transantarctic Mountains. "We wanted to see what types of microbes can live in the extreme conditions found in this area—cold, dry and salty soils," he says. Indeed, they found bacteria and fungi surviving in areas that had recently been covered in ice. What he discovered was that soil microbes are terrestrial die-hards. After all, they have been around for an estimated 4 billion years. "Don't worry about them being eradicated," says Fierer. That's good news, because as humans continue to pursue strategies to live longer and healthier, the soil microbiome may be the one thing in the end that helps save us all. ●

The Microbiome Crossover

Promising research links soil microbiomes to alleviating ailments.

BY MICHAEL BEHAR

There are billions of microbes populating the soil, and thousands of them find their way onto and into the plants we eat.

When a plant is harvested, soil clings to its roots, chauffeuring microbes along for the ride. Microbes also ferry themselves into plants through conduits called aqueous channels—tiny strawlike structures that plants use to extract water and nutrients from the soil.

Scientists still are trying to figure out which soil microbes directly benefit the human gut microbiome when we ingest them, and which ones prompt a secondary biological reaction that helps fight diseases. But contact with soil microbes has been linked to lower incidences of asthma, eczema, chronic inflammatory disorders and allergies. Meanwhile, studies show that eating plants alters the human gut microbiome, stimulating antidepressive effects, alleviating stress and boosting our immune response to illness.

The Human Microbiome Project has turned up evidence that the microbes in our intestines play a role in weight gain, sleep, Crohn's disease and diabetes. It has also revealed that the DNA from microbes living in our guts may be more significant to human health than our own genes.

The next step for scientists is to figure out how soil microbes interact with our microbiome to protect us from illness.

EATING FOR YOUR GENES

Nutrigenetics—that is, matching your diet to your DNA—is touted as the future of wellness and disease prevention. But do we all really need special, customized eating plans?

BY PATRICK CLINTON

Way, way back when the human race was young—sometime after the age of dinosaurs but before the invention of salad forks and pants with pockets—our ancestors never devoted one second to wondering what they ought to eat. They ate what they could. And that depended on where they lived. If there were fruits, leaves and insects, that's what was on the menu. Ditto if there were caribou and walruses in the neighborhood. There was no other choice.

Over time, human beings in different nutritopes (the fancy scientific term for areas defined by what's available to eat) adapted to get the most out of their diets. A walrus eater would be born with a genetic mutation that kept her heart healthy despite the saturated fat in the blubber she ate. And eventually, through natural selection, almost all the babies in her village would have the same gene variation, called a polymorphism—a mutation that has become well established in a population. Through a similar process, herders in Northern Europe mostly ended up with a genetic mutation that let them continue to digest lactose as adults, while the rest of the world mostly didn't. And Polynesians who went on long sea voyages developed the ability to function with

CYP2R1
rs10741657
GG Genotype
TOP FOODS
Oysters
Wild mushrooms
Yogurt
SVCT1 rs4257763
GG Genotype
TOP FOODS
Oranges
Red bell peppers
Broccoli
FADS2
rs174575
GG Genotype
TOP FOODS
Mackerel
Salmon
Herring

less vitamin C than the rest of us—helping them fend off scurvy.

But then things changed. Across the planet, people pulled on their pants, put their salad forks in their pockets and left the old neighborhood. They crossed continents, navigated oceans and intermarried with everybody they met along the way. They also killed off game, cut down forests and invented modern agriculture—as well as sliced bread, refrigerated trucks, supermarkets and Big Macs. By the time they got done, the old nutritopes were largely gone or changed beyond recognition, and most of us were a genetic muddle, not necessarily optimized for any traditional diet.

However, those genes we inherited from our ancestors are still in there. So it makes sense that if you could figure out which ones you carry, you could align your diet with the sweet spots they create and get healthier, happier and thinner.

Not getting enough choline can cause fatty liver disease. The dietary Rx: get more choline from food or a supplement.

Science has been chipping away at that idea for a long time, arguably since the early days of the 20th century, when Archibald Garrod discovered that alkaptonuria, a disease that prevents the body from processing certain proteins, was inherited. The field he created—"inborn errors of metabolism"—eventually led to the birth of nutrigenetics and nutrigenomics, the twin sciences of how your genes interact with the food you eat and, in turn, affect your health. (What's the difference? Nutrigenetics is more about health impacts; nutrigenomics has to do with the molecular nuts and bolts of how those impacts happen.)

And nutrigenetics has been making pretty remarkable progress recently—especially considering that each person has between 20,000 and 25,000 genes, consisting of 3 billion base pairs of DNA. For those who need a refresher: Your DNA is a big instruction manual for building and operating a human body written in four chemical bases, or "letters"—the molecules known as G, T, C and A. Changing a single letter can be enough to alter how your body works. A change that's well established among humans—like the walrus-eating thing I mentioned—is most commonly a single-nucleotide polymorphism, or SNP. Although there are other types of polymorphisms, SNPs are the primary thing that nutrigeneticists look at, and the average human has 4 million to 5 million of them.

Science has made hundreds of links between genes, diet and physical outcomes. We've learned that a variation in a gene called FTO predisposes people to obesity. We've learned that those with a particular alteration in the gene APOA2 lose more weight when they reduce saturated fat in their diet compared with people without the variation. And we know that more than 10% of American women have a variation in the gene MTHFR that can lead to birth defects like spina bifida in their babies unless the pregnant women supplement their intake of folate.

When you think of how little we knew about this sort of thing even a decade ago, the growth of nutrigenetics has been absolutely explosive. On the other hand, when you think of how much there is still to know, it's another story. There are more than 100 million known SNPs and an estimated 25,000 bioactive substances in food—compounds that aren't essential nutrients but that can affect the way your body operates, including things like lycopene, resveratrol, tannins and basically every unfamiliar name you see in an article about The Next Miracle Nutrient. It's going to take some time to get through them all and understand how they play together.

But wait. Can't you already get personalized diet recommendations based on your genes from a zillion different spit-in-a-tube DNA testing companies? Well, it's true that a bunch of them—including Habit, Orig3n and 23andMe—offer a panel of tests related to health and nutrition. Typically, they look at SNPs in 20 or 30 genes and tell you things like if you're lactose-intolerant, whether you're prone to a half-dozen vitamin deficiencies, how you metabolize caffeine, alcohol and different kinds of fats, and if you carry a gene that makes cilantro taste weird to you. It's interesting, I guess, but the advice—especially after the Food and Drug Administration cracked

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PERSONALIZED NUTRITION INSIGHTS, BASED ON KNOWLEDGE OF AN INDIVIDUAL'S GENETICS, MIGHT IMPROVE HEALTH OUTCOMES.

DUE TO VARIANTS IN A GENE, YOU COULD HAVE INCREASED SENSITIVITY TO PROCESSED MEATS AND, AS A RESULT, A GREATER COLON CANCER RISK.

down on the consumer-DNA industry a few years back—tends to be extremely cautious and not really all that personalized. So, yes, it's nutrigenetic advice. But only in the same sense that the Speak & Spell you had when you were a kid is a laptop computer.

Real personalized nutrition still faces some big hurdles. First, there are a lot of SNPs to test to see what they do. Then there's the enormous problem of figuring out which of the discoveries are real and which are experimental error or a statistical glitch. Martin Kohlmeier, M.D., Ph.D., a nutrition research professor at the University of North Carolina, notes in his book *Nutrigenetics: Applying the Science of Personal Nutrition* that most of the new results that get published won't ultimately pan out.

And a lot of the things we "know" now will unfortunately fall into the same category. A few years back, for example, researchers analyzed more than 600 genetic association studies. Only about one study in six had its results confirmed in a follow-up paper, and just 1% of the 600 were replicated twice or more (a sign that, scientifically, you're really onto something). Let's be optimistic and say that study results will be confirmed half the time. That leaves 500 coin flips. "The industry makes it seem like personalized nutrition is ready for prime time, and it's not," says *EatingWell* advisor David L. Katz, M.D., M.P.H, founding director of Yale University's Yale-Griffin Prevention Research Center and author of *The Truth About Food*.

But even when the knowledge base about genes and diet gets more solid—and leaders in the field believe that might be only a few years off—there will be the question of what to do with it. A personalized diet sounds like a wonderful thing, but as Kohlmeier points out, if you go beyond one or two genes, things can get complex. Imagine, he says, that you're trying to adjust your diet to meet nutrition needs based on a handful of gene variants: say, total calories need to come down by 8%, sodium by 20% and saturated fat by 50%. You need to up your total folate and vitamin C by 50%, reduce your folic acid by two-thirds and get your calcium/magnesium ratio under 2.6.

So what's for dinner?

Most of us, working with real-life ingredients—tomatoes and greens and pork chops—would have a hard time translating that information to our plates. And it's not clear that we even have to deal with every message we get about our genes. Many SNPs, taken individually, aren't that impactful. The outcomes that most of us care about—obesity, diabetes, heart disease, cancer—involve dozens of genes interacting in ways we don't yet understand. Genes can also be turned on and off. They do different things at different times of life and in different parts of the body. So how much does a single gene contribute to a person's developing

one of these conditions? "Very little," says Cecile Janssens, Ph.D., a professor of epidemiology at Emory University whose research focuses on how genomic studies translate into clinical and public health practice. "It's likely less than 1%."

What's more, experts estimate that, overall, genes explain only about 10% of the risk linked to diet-related diseases like obesity and type 2 diabetes. "It's *Homo sapiens* arrogance to think we can't know what to eat until we're all individually profiled—because we're all so unique and special," says Katz. "There are fundamental truths to feeding humans, just like dolphins should eat fish and pandas should eat bamboo. Ninety percent of health is a diet that applies to everyone. Someday we'll be able to use personalized nutrition to ice the cake. But the cake itself is just a generally healthy diet." In other words, your body doesn't demand a perfect diet, just a good one.

What we will be able to do with all the spectacular nutrigenetic data we're going to acquire is use it to make better diagnoses of diseases and recommendations for dietary changes that really do matter. Kohlmeier gives a great hypothetical example: A 51-year-old man has an enlarged liver. He is overweight and has stopped drinking alcohol, and his cholesterol is under control, thanks in part to a diet low in eggs, meat and saturated fat and high in fruits, vegetables and whole grains—still, his condition is getting worse. The textbook medical approach would call for weight loss and exercise. But a DNA test his physician gave him shows that the patient has a gene variant that means his body doesn't synthesize choline well—and he's eliminated perhaps half his intake of this nutrient by eating less meat and eggs. Not getting enough choline can cause fatty liver disease. The dietary Rx: get more choline from food or a supplement.

You'll notice that this isn't the kind of nutrition wisdom you'd expect to get from a website or an app. And that's probably going to be true of much of the nutrigenetic advice we receive in the near term. It's going to sensitize physicians to the range of variations they should expect to see in their patients, and it's going to provide a way to connect the dots between symptoms, genes, diet and factors like physical activity and environment. Ultimately, this knowledge could provide the basis for deeply informed health coaching.

There's already a prototype of what that kind of coaching could look like. A few years back, a team led by Leroy Hood, M.D., Ph.D., a super-important figure in the history of genome sequencing, started Arivale, a company aimed at developing an extremely detailed picture of what is going on in the body and using it to deliver health strategies to customers via skilled coaches. They looked at DNA—not just a few genes, but the whole shebang—then did repeated tests of pretty much anything you've ever heard of and more, like blood pressure, cholesterol, height, weight, waist circumference, cortisol levels, microbiome, proteins that affect heart and brain function, and metabolites (the end products of chemical reactions in your body—sugars, lipids, amino acids, fatty acids and the like). Then they threw in a whole lot of computing power to make sense of it all and provided clients with personalized diet and lifestyle plans to improve health outcomes.

The results, by all accounts, were impressive. People who stuck with the program saw their cholesterol, triglycerides, waist diameter and hemoglobin A1C all move in the right directions—enough to have a substantial impact on health. And because Arivale continually analyzed its own data, looking for new connections between genetics and health, it was likely to get even better.

I say "was" because Arivale went out of business in 2019. The problem, according to co-founder Nathan Price, Ph.D., associate director of the Institute for Systems Biology, which developed the concept: "The economics just didn't work out. Basically the program is too expensive for what people can pay." That was still true even after Arivale cut its subscription price from about $3,500 a year to $99 a month.

Not to worry. Arivale or something similar will be back. They've figured out the hard part—how to better people's health based on DNA. Now they just have to figure out how to pay for it, and costs are coming down all the time. Give it a few years.

In the meantime, eat your vegetables, watch your saturated fat, stay active and have a little faith in the ongoing ingenuity of the human race. Despite occasional glitches, we're not so dumb.

I mean, we invented the salad fork. ●

THE HEALTHY-AGING DIET

Eat more of these seven antioxidant-rich foods to help you live longer.

NICCI MICCO, M.S.

There are many variables involved in how long you live, but by following a healthy lifestyle, staying active and eating a nutrient-packed diet, you can help slow the aging process and perhaps even stave off age-related diseases, including osteoporosis, diabetes and heart disease. Start right now by including more of these antioxidant-rich foods to your diet. Here's to your good health!

1. Yogurt

In the 1970s, Soviet Georgia was rumored to have more centenarians per capita than any other country. Reports at the time claimed that the secret of their long lives was yogurt, a food ubiquitous in their diets. While its age-defying powers have never been proven directly, yogurt is rich in calcium, which helps stave off osteoporosis and contains "good" bacteria that help maintain gut health and diminish the incidence of age-related intestinal illness.

2. Blueberries

In a landmark 1999 study, researchers at Tufts University's Jean Mayer Human Nutrition Research Center on Aging in Boston fed rats blueberry extract for eight weeks, which in "rat lives" is equivalent to 10 human years. These rats outperformed rats fed regular chow on tests of balance and coordination when they reached old age. Compounds in blueberries (and other berries) have been shown in follow up studies to mitigate inflammation and oxidative damage, which are associated with age-related deficits in memory and motor function.

3. Wine

Alcohol in moderation protects against heart disease, diabetes and age-related memory loss. Any kind of alcoholic beverage seems to provide such benefits, but red wine has been the focus of much of the research. Red wine contains resveratrol, a compound that likely contributes to its benefits-and, according to animal studies, may activate genes that slow cellular aging. Recent health guidelines indicate drinking any amount of alcohol could have downsides to your health, so if you don't already drink, there are other ways to reap these health benefits.

4. Fish

Thirty years ago, researchers began to study why the native Inuits of Alaska were remarkably free of heart disease. The reason, scientists now think, is the extraordinary amount of fish they consume. Fish is an abundant source of omega-3 fats, which help prevent cholesterol

buildup in arteries and protect against abnormal heart rhythms.

5. Nuts

Studies of Seventh-Day Adventists, a religious denomination that emphasizes healthy living and a vegetarian diet, show that those who eat nuts gain, on average, an extra two and a half years. Nuts are rich sources of unsaturated fats, so they offer benefits similar to those associated with olive oil. They're also concentrated sources of vitamins, minerals and antioxidants.

6. Chocolate

The Kuna people of the San Blas islands, off the coast of Panama, have a rate of heart disease that is one-ninth that of mainland Panamanians. The reason? The Kuna drink plenty of a beverage made with generous proportions of cocoa, which is unusually rich in flavanols that help preserve the healthy function of blood vessels. Maintaining youthful blood vessels lowers risk of high blood pressure, type 2 diabetes, kidney disease and dementia.

7. Olive Oil

Four decades ago, researchers from the Seven Countries Study concluded that the monounsaturated fats in olive oil were largely responsible for the low rates of heart disease and cancer on the Greek island of Crete. Now we know that olive oil also contains polyphenols, powerful antioxidants that may help prevent age-related diseases by improving the body's ability to clear out dead or damaged cells. ●

CHAPTER 2

POWER YOUR MIND

Staying sharp as you age is a key aspect of longevity. Eating nutrient-dense foods can protect your brain for years to come.

WHAT TO FEED YOUR BRAIN

Simple lessons from popular healthy diets can help prepare you for lifelong mental fitness.

BY EMILY JOSHU

As researchers work to discover the causes and prevention of age-related cognitive decline, a growing body of research points to lifestyle factors, such as diet and exercise, as possible prevention measures. Dementia, characterized by a deterioration of memory and thinking, affects approximately 50 million people worldwide, with 10 million new cases per year, the World Health Organization estimates. Alzheimer's disease, the most common type of dementia, is the sixth leading cause of death in the U.S. and affects 5.7 million Americans, two-thirds of whom are women over age 65.

As the Alzheimer's Association states that deaths from Alzheimer's disease increased 145% between 2000 and 2019, there is a growing sense of urgency to uncover prevention methods that can be practiced from an early age. One way to do that could start with what you eat. "Nutrition plays a huge role in most body functions and how we function, including aging," says Liz Weinandy, M.P.H., a registered dietitian at the Ohio State University Wexner Medical Center. For example, a 2019 study of dementia-free elders published in the journal *NeuroImage* found that distinct nutrient biomarker patterns were associated with cognitive health and functional brain network efficiency. A 2015 study in the journal *Alzheimer's & Dementia* showed that adhering to the MIND diet was linked to lower rates of Alzheimer's. And another 2015 study from the same publication found a link between the MIND diet and slower rates of cognitive decline.

The brain's composition is one reason that it needs certain nutrients to thrive. The brain is approximately 60% fat, and consuming healthy fats

is vital for proper brain development and protection against cognitive decline. Omega-3s, polyunsaturated fats that the body can't make on its own, are one of the more healthful fats that the brain needs. "[Omega-3s] are really important for the stability of a lot of the cells in the brain and for the cells to work properly. We want to keep the brain cells functioning at a high level," Weinandy says. "There are lots of things that influence brain function, but when we talk about diet, omega-3s in particular play a huge role in the phospholipid around the outside of the cells. If the integrity of that cell is not real great, then those cells are compromised and they don't work as well."

Since the brain can't make omega-3s on its own, healthy food sources are essential. Fatty fish are one of the most common sources of omega-3s. For example, a 3.5-ounce serving of mackerel contains more than 5,100 milligrams of omega-3s, as well as 200% of the recommended daily intake of

vitamin B_{12} and 100% of the antioxidant selenium. Nutrient-dense salmon is another popular source of omega-3s, and additionally it contains high levels of vitamins D and B. Omega-3s are also found in chia seeds, walnuts and extra-virgin olive oil.

Omega-6s, however, are a type of polyunsaturated fat that can be obtained only through diet. While the body needs at least some level of omega-6s to protect against chronic disease, too many can increase the risk of harmful inflammation. These fats are typically found in mayonnaise and vegetable oils, such as canola, soybean and sunflower oil. "We need omega-6s. It's an essential fat that we can't make, so we need to take them in for food. The real issue is just that most people are taking way too many sixes in saturated fat, too much of those in and way, way too little of the omega-3s," Weinandy says. An easy way to limit omega-3s is to replace vegetable oil with extra-virgin olive oil. Weinandy also points to B vitamins as essential for brain and nervous system health. These are found in dairy, fatty fish, lean meats, dark leafy greens, whole grains, nuts and seeds.

The nutrient choline, which is produced in small amounts by the liver but is primarily obtained from such foods as eggs, fresh cod, salmon and broccoli, is crucial to memory formation. The brain needs choline to produce the neurotransmitter acetylcholine, which impacts muscle movement, thinking and working memory. Low levels of acetylcholine have been linked to learning and memory impairments, as well as to Alzheimer's and dementia. Foods that promote brain health can also reduce inflammation and oxidative stress, an imbalance between free radicals and antioxidants, which fight infection and lower chronic disease risk.

If you're looking to strengthen your brain with these nutrients, there's an eating plan for that. Brain-healthy foods are the foundation of the MIND diet, or Mediterranean-DASH Intervention for Neurodegenerative Delay. The goal of the MIND diet is to reduce the risk of disorders, such as Alzheimer's and dementia, and cognitive decline that accompany aging. As the name implies, the MIND diet takes inspiration from the popular Mediterranean and DASH diets, which amplify fruits, vegetables, whole grains, legumes and fatty fish to protect against chronic conditions, such as diabetes and heart disease. These diets are also consistent with the recommendations of the 2020 Dietary Guidelines for Americans from the U.S. Departments of Health and Human Services and Agriculture, which advise a diet of leafy greens, legumes, fruits, whole grains, dairy, learn meats, eggs and fatty fish. The MIND and Mediterranean diets both caution against added sugars, refined grains (such as white bread and pasta), margarine and red meats.

"They took two of the very best diets that have been shown time and time again to be the healthiest," Weinandy says. "They're really very similar, but there are some small differences."

While the Mediterranean and DASH diets both recommend eating a variety of fruits and vegetables, berries specifically are a primary fruit that has been shown to improve brain function. "It's more of a precise diet that's really targeted toward brain function. It's a pretty comprehensive approach to eating," Weinandy says. A recent study in *Annals of Neurology*, for example, found that berries were associated with significantly lower rates of cognitive decline among older women. These can be used as a colorful topping for Greek yogurt or as a healthful midday snack. The MIND diet also specifically cautions against high consumption of cheese, advising that it should be limited to about once per week.

Try replacing a steak at dinner with salmon or lean chicken, or replace a bowl of ice cream for dessert with berries and Greek yogurt.

Beyond influencing the brain's ability to protect against cognitive decline and disease, nutrition can also influence mood and mental health. For example, the amino acid tryptophan, found in turkey, tofu, chicken and pumpkin seeds, produces the B vitamin niacin, which is vital for creating the neurotransmitter serotonin. A lack of serotonin can worsen overall mood, which increases the risk of mood disorders, such as depression. A 2016 study in the journal *Nutrients*, for instance, found that emotional processes were inhibited in subjects who had depression or a high risk of developing it when subjects were depleted of tryptophan. Additionally, a 2015 study in the *Archives of Psychiatric Nursing* found that among 25 healthy young adult subjects, higher doses of dietary tryptophan resulted in significantly less depression and irritability and decreased levels of anxiety.

Likewise, anti-inflammatory properties found in omega-3s, vitamin D and folate have been linked to positive effects on depression and anxiety. A small double-blind study in the *Journal of Affective Disorders*, for example, found that Parkinson's patients who took fish oil omega-3 supplements presented an improvement in depressive symptoms. And a 2013 meta-analysis in the *British Journal of Psychiatry* noticed a link between depression and vitamin D in study participants and found that those with vitamin D deficiency are at greater risk for developing depression. "There have been studies looking at these [effects], and it shows that usually healthy food or healthy dietary patterns are also considered as being related to a lower risk of depression, anxiety, those psychological, mental health issues," says Yian Gu, M.D., Ph.D., assistant professor of neurological sciences at Columbia University. However, Gu emphasizes that these effects are difficult to measure in observational studies.

Advanced glycation end products, or AGEs, have also been linked to cognitive function and diseases associated with aging, such as Alzheimer's. AGEs are compounds formed when protein or fat mixes with sugar in the bloodstream, otherwise known as glycation. Diet is considered the largest contributor to the development of AGEs, since AGEs are often found in foods that have been exposed to high temperatures or dry heat, such as grilled, fried, sautéed, barbecued or toasted foods. AGEs also increase oxidative stress and inflammation throughout the body, including in the brain. High levels of AGEs have been associated with Alzheimer's disease, as well as heart disease, diabetes, liver disease, arthritis and high blood pressure. A 2015 study in the *Journal of Clinical Endocrinology & Metabolism* found that AGEs were associated with diminished cognitive and memory function, including the ability to recall specific words. A 2019 study in the *Journal of Alzheimer's Disease* found that high concentration of AGEs could "be a predictor of a long-term decline in cognition-related daily living performance" in patients with Alzheimer's disease, the authors wrote. Other studies have shown that foods containing AGEs can induce higher levels of oxidative stress in the brain.

While grilled and roasted meats, full-fat dairy and highly processed foods could increase the amount of AGEs, consuming foods consistent with the MIND diet—fruits, vegetables, whole grains—can lower AGE levels. "It all goes back to the same

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ANTHOCYANINS, FOUND IN RED, BLUE AND PURPLE BERRIES, CAN PROTECT BRAIN CELLS FROM AGING.

thing. It's like eating this pretty healthy diet and staying away from those foods that we know are not so healthy," Weinandy says.

For newcomers, the tenets of the MIND diet can feel overwhelming. Both Gu and Weinandy caution against diving in too quickly and recommend starting slow. "If somebody was just looking at this and if they eat very far from what's recommended, it can seem very daunting to try to do this. And this is where, as dietitians, we always like to see people just take small, gradual steps because, usually, if people try to just dive into something that's very different from what they do currently, it won't last long," Weinandy says. "So instead of failing, I would tell people to look at where they are now." Weinandy recommends incorporating one or two items every one to two weeks. Try replacing a steak at dinner with salmon or lean chicken, or replace a bowl of ice cream for dessert with berries and Greek yogurt. If your morning smoothie

usually includes oranges and bananas, consider adding mixed berries and unsweetened almond milk. "Try to make those small shifts in how a person eats and maybe try to trade out some of the red meat for fish or poultry and trade out butter for olive oil. Some of those small shifts can really make a difference over time," Weinandy says.

Making these swaps in between meals is also a gradual step to following the MIND diet. For a brain-healthy snack, consider choosing nuts. A 2018 study in the *Journal of Nutrition, Health & Aging* of nearly 5,000 Chinese individuals over age 55, for example, found that the long-term high consumption of nuts, including peanuts, was associated with a lower likelihood of having poor cognitive function. Peanuts, which are technically legumes, are high in unsaturated fats, folate, vitamin E, magnesium and potassium, which provide anti-inflammatory, antioxidant and lipid-lowering benefits. To get in more leafy greens, consider adding a side salad to your dinner in place of starchy foods. Just half a cup of spinach contains 1.9 milligrams of the powerful brain-healthy antioxidant vitamin E, or 10% of the daily recommended intake. "This type of healthy diet is not something surprising," says Gu, pointing out that most people are already aware that fruits and vegetables are key components of a full-body healthy-eating plan.

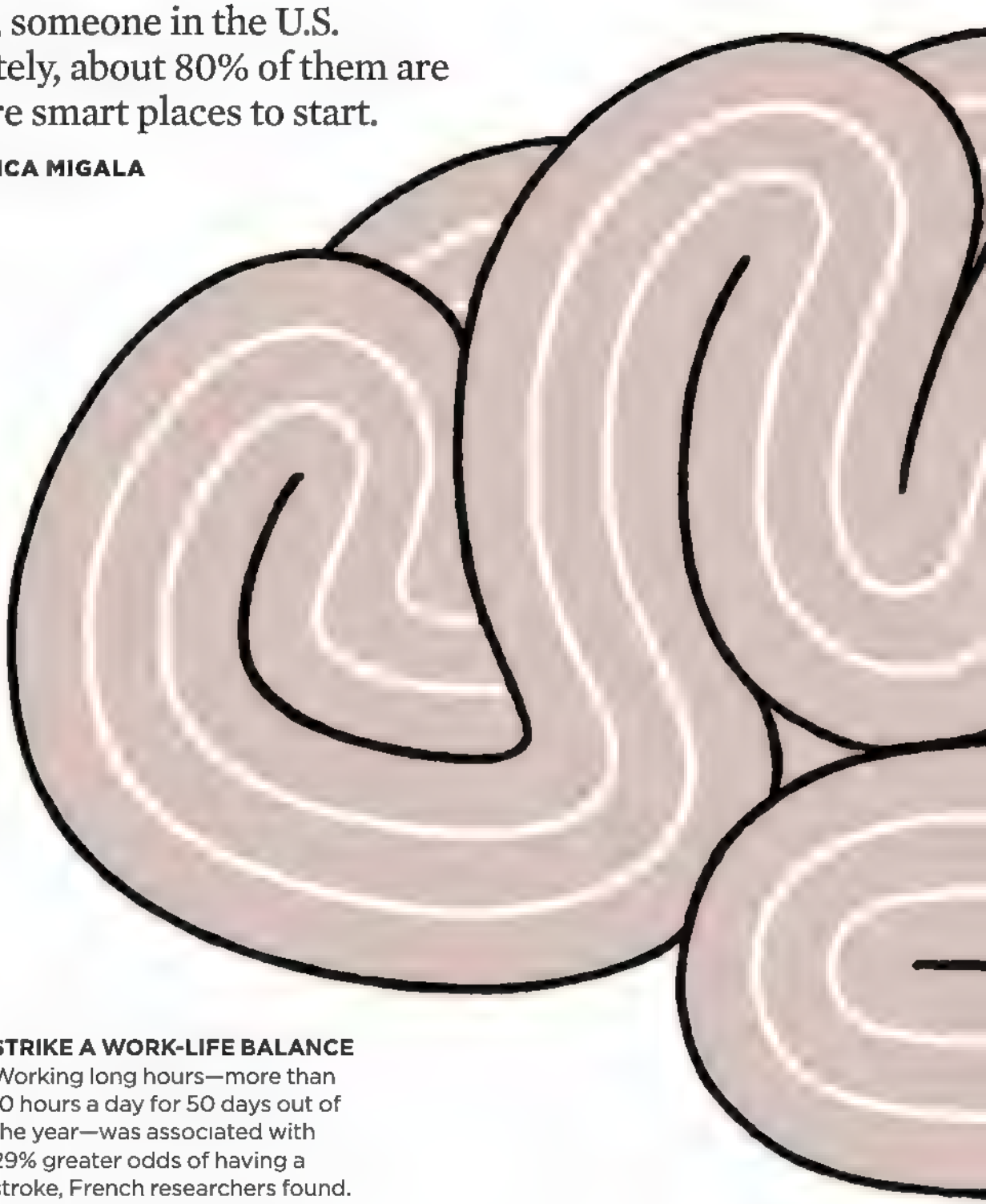
And unlike many fad diets that focus on restrictions and strict counting of calories, carbs and fat, the MIND diet is not an exact science of what you have to eat and when. "You don't have to be exact. There's nothing that says you have to have exactly a certain amount of fish in a certain amount of time," Gu says. "It's not that strict; just take this as a rule of your daily food intake to try to reduce your high fat intake, red meat intake, and to try to increase your vegetable, fish, fruit intake." Gu adds that "if someone is interested in this and they are paying attention to getting this healthy diet, it's not a very hard thing to do. It's just you need to get this in your mind and stick with it." Experts also recommended pairing this dietary pattern with regular exercise to keep the entire body strong as it ages. "Any level of physical activity should be good because it will reduce your time sitting," says Gu.

While the goal in making these dietary changes is to prevent cognitive disorders associated with aging, starting early can pave the way for better brain health later in life. "Alzheimer's disease and dementia are not happening over one night. It takes decades or many, many years for these diseases to develop," Gu says. "When certain pathological changes are already occurring in your brain, it's really hard to reverse the process, so it's really important to prevent that as early as possible." ●

How to Outpace a Stroke

Every 40 seconds, someone in the U.S. suffers a stroke. Fortunately, about 80% of them are preventable. Here are smart places to start.

BY JESSICA MIGALA



Your brain and your heart are the biggest players when it comes to a stroke—which occurs when oxygen and nutrients can't get to the brain, often because a clot blocks the blood vessels going to your head. Two major factors that can (independently) lead to a stroke are high blood pressure and high cholesterol.

Hypertension damages blood vessels, and cholesterol can cause the buildup of fatty deposits that narrow arteries, says cardiologist and *EatingWell* advisor Philip Ades, M.D. Scary, yes, but healthy habits, like these four, can go a long way toward keeping arteries strong and resilient.

NOSH ON SOME WALNUTS

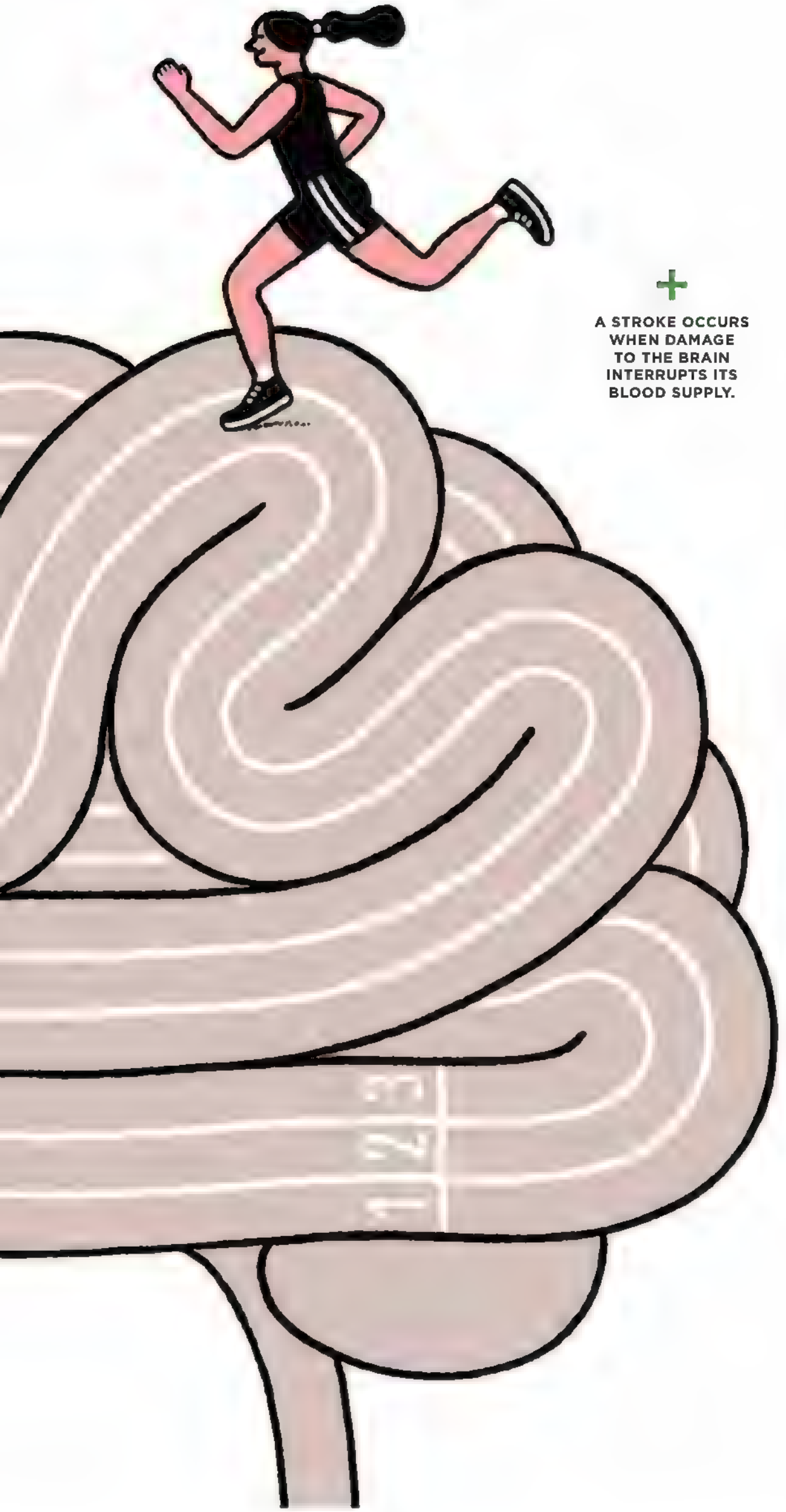
Eating a 1-ounce serving of this nutty snack at least once a week was associated with a 17% lower risk of stroke, according to research at Brigham and Women's Hospital and Harvard Medical School.

Walnuts are a top source of heart-healthy alpha-linolenic acid (ALA), a plant-based type of omega-3 that has been linked to healthy cholesterol and triglyceride, improved blood vessel function and reduced inflammation (important because high levels of inflammation can damage arteries). All together, this helps prevent plaque buildup, blood clots and vascular weakening that can contribute to a stroke.

STRIKE A WORK-LIFE BALANCE

Working long hours—more than 10 hours a day for 50 days out of the year—was associated with 29% greater odds of having a stroke, French researchers found. The reason? Constant on-the-job demands and the chronic stress that comes with them appear to negatively impact vascular function, possibly by increasing inflammation in the body.

If you can shift things around to improve your work-life balance, great. Otherwise, make sure you're prioritizing other



A STROKE OCCURS WHEN DAMAGE TO THE BRAIN INTERRUPTS ITS BLOOD SUPPLY.

prevention strategies. One to consider: yoga. Not only is it a proven stress-buster, but the mind-body activity may also help lower blood pressure and cholesterol levels.

GET A MOVE ON

When you walk, are you a tortoise or a hare? Compared with slow strollers (a pace of 1 mile per hour), those who moved at a faster clip (3.5 mph) had a 44% reduced likelihood of a stroke, a recent review in the *Journal of Sport and Health Science* concluded.

Walking speed is an indicator of your overall aerobic fitness and blood vessel function. If you're a slow walker, it may be time to do more cardio. During workouts—no matter your exercise of choice—use the talk test to make sure you're pushing yourself enough.

The exercise should feel challenging to the point where you can say only short sentences. Once you can do this for 30 minutes straight, boost the activity length and frequency.

GO BANANAS

Curbing sodium has been a top recommendation for controlling hypertension for decades. But consider increasing potassium at the same time. Getting nearly twice as much sodium as potassium is associated with a 22% greater stroke risk, according to research in the journal *Clinical Nutrition*, while consuming more potassium lowers this risk.

Sodium makes your body hold on to water, which raises blood pressure. "Potassium helps to regulate this fluid retention," says Penny Kris-Etherton, Ph.D., R.D., from the American Heart Association. Limit sodium to 2,300 milligrams a day (1,500 if you have hypertension) and aim to get 4,700 milligrams of potassium—a doable target if your diet is rich in fruits and vegetables.

LOOK ON THE BRIGHT SIDE

A sunny outlook doesn't just mean feeling happier in the present. Research has shown that optimism can help stave off disease and lead to a healthier, longer life.

BY COURTNEY MIFSUD

In 2019, researchers from Boston University found evidence suggesting that optimistic people live longer than pessimists. The researchers found that those who scored higher on an optimism assessment were more likely to live past the age of 85. The study, which was published in *Proceedings of the National Academy of Sciences*, followed women enrolled in the Nurses' Health Study and men in the Veterans Affairs Normative Aging Study over a long-term period. The women had been followed since 1976, and in 2004 they completed a six-question optimism assessment. Their survival was recorded until 2014. The researchers had followed the men since 1961, and in 1986 the men completed a baseline assessment with 263 true or false statements about their experiences and their outlook on life. People with higher optimism levels at the start of the study were more likely to be physically active and less likely to have health conditions, such as depression and diabetes. But even when researchers looked beyond those factors, there was still a connection between optimism and a longer life span.

There is a growing recognition that optimism and positivity influence our health. Not only does a brighter outlook tend to lead to healthier habits, but there is also significant research to suggest that looking at the glass half full can help ward off chronic diseases, such as heart disease, and add years to our lives.

Researchers from Johns Hopkins Medicine found that people with a family history of heart disease who had a positive outlook were one-third less likely to have a heart attack or other cardiovascular event within five to 25 years than those

with a more negative outlook. The finding held even in people with family history who had the most risk factors for coronary artery disease. The study included 1,483 healthy people with siblings who had experienced some sort of coronary event (including heart attack and sudden cardiac death) before age 60. The study participants were followed for 25 years and filled out surveys about their well-being, life satisfaction, anxiety levels, mood and level of health concern. "The siblings at highest risk for coronary artery disease, who had more positive well-being, were 50% less likely to have a coronary artery disease event," says Lisa R. Yanek, M.P.H., assistant professor of medicine and co-director of the GeneSTAR Research Center at the Johns Hopkins University School of Medicine, who led the 2013 study. "We are especially interested in anything that may reduce risk for the people who are at highest risk for disease."

Evidence-based therapies, such as cognitive behavioral therapy, are the bread and butter of strengthening mental health.

There is a chicken-and-egg paradox at play with the research surrounding optimism and health, points out William Lamson, Ph.D., a psychologist at Weill Cornell Medicine and New York-Presbyterian. "[Optimists] tend to be more consistent in their healthy habits. They tend to get better sleep and to actually eat more fruits and vegetables. Now is this a function of [them being] so optimistic that they are hopeful and they think this is helpful for them, so they live in this way? Or is it these healthy behaviors that are actually driving these health benefits?"

It may be due to what is going on in an optimist's brain versus a pessimist's. "If we're tending to look at a future and we're kind of seeing brightness, we're tending to look at life events and we're not seeing adversity, we're not seeing doom or danger. And we're kind of hopeful about that, we're going to have a little bit more serotonin," says Lamson. Serotonin is the hormone that stabilizes our moods and contributes to our overall feelings of well-being. It functions as a neurotransmitter that carries signals between nerve cells along the central nervous system. Not only does serotonin regulate our mood, it helps our health in other ways, from facilitating sleep to promoting blood clotting to aiding digestion.

How do you go about crafting an optimistic outlook? Lamson suggests that simple everyday things, such as going outside, scheduling Zoom calls with loved ones or even scheduling other daily activities, can build a routine that helps people look at the glass as half full. "If I can get all of my patients to do one thing, it would be just taking a walk or exercising three times a week," says Lamson. Jessica Stern, Ph.D., a clinical psychologist at NYU Langone Health, finds that gratitude journaling helps her feel nourished and reminds her of the moments in her life that make her happy.

Promising research also suggests that certain foods can have a direct impact on mental health and mood. "There is evidence that bacteria in the gut—there's more bacteria there than there are human cells in a body—produce neurochemicals like serotonin. Some studies indicate that the gut is actually making the vast majority of the serotonin for our body," says Ginger Hultin, M.S., R.D., the Seattle-based author of *Anti-Inflammatory Diet Meal Prep*. Hultin explains that gut bacteria thrive in an environment where fibrous foods are moving through, so think lots of vegetables, whole grains, beans, lentils and fruit. Bananas in particular are a great snack. They contain fiber as well as complex carbohydrates, potassium, vitamin C and vitamin B_6. "B_6 is important to brain health because it is essential for the production of the hormone serotonin," says Hultin. "Other foods high in B_6 include avocados, pistachios, sweet potatoes, tofu and meat."

While loading up on brain-friendly nutrients can help, stress can lead to some food habits that do more harm than good. Who hasn't reached for something sweet or salty when they're feeling stressed or anxious? However, multiple studies have found a connection between foods high in refined sugars and worsening symptoms of mood disorders, such as depression. Hultin cautions that it's not as if you eat one of these foods and your brain takes immediate damage. "Many of these outcomes are longer term—the overconsumption of highly processed food over time causing high blood pressure, high cholesterol or diabetes. All can cause blood

flow issues and more negative outcomes in brain health," says Hultin. "I guide my clients to looking at their overall dietary pattern over time rather than a one-food-at-a-time approach."

Beyond lifestyle tweaks, evidence-based therapies, such as cognitive behavioral therapy, are the bread and butter of strengthening mental health not just to look on the bright side, but to manage life stressors that can trigger negative health outcomes. "What I tell people is that therapy is proactive or offensive rather than being reactive or defensive," says Stern, who adds that therapy is a way to strengthen one's toolbox to weather life's stresses.

Stern hopes that if we can apply a new narrative to the concept of therapy, it can destigmatize the practice. "And so rather than thinking about [therapy] as a way of mitigating or minimizing risk or weakness, instead think about it as building strength, building muscle, building healthy dental care, which can be preventative in the long run," says Stern. "Oftentimes we think about mental health as a way to fix issues or to come back from a bad state that we're in. And what I really like about this concept of focusing on optimism and on the psychology is that it allows us to think about our mental health from a strength-based approach and a preventative approach. I like to think about it as sort of learning to dance in the rain. We might not be able to control the rain or the weather at all, but if we learn to dance in the rain, it makes life easier and makes us feel more prepared to navigate any type of unexpected situation." ●

CHAPTER 3

LASTING RADIANCE

There might not be a fountain of youth, but these skin-care secrets can keep you looking great for years.

12 FOODS FOR YOUNGER-LOOKING SKIN

If you want beautiful skin, what you eat matters. Here are a dozen beauty foods to help keep your skin healthy, fight inflammation and keep aging at bay.

BRIERLEY HORTON, M.S., R.D., AND LAUREN WICKS

When it comes to beautiful skin, we often lean heavily on what we can put on—or in (hello, injectables)—our skin, like face and eye creams and sunscreen. Turns out, what you put in your body as part of your daily diet can help keep you looking youthful too—in addition to fighting inflammation, which plays a role in physical ailments, such as psoriatic arthritis and diabetes.

Here are 12 foods to help fight wrinkles and inflammation as well as boost collagen and hydration for healthy, younger-looking skin.

1. Kale

This leafy green has already reached nutrition superstardom, but now you can add anti-aging skin powers to its list of accolades. Kale is brimming with lutein and zeaxanthin, two carotenoids that, according to research published in the journal *Clinics in Dermatology*, can boost your skin's elasticity and hydration, as well as the fat under your skin, which acts as a "measure" of youthfulness. Lutein specifically also appears to be able to shield your skin from blue light, a particularly harmful wavelength of light (and one that sunscreen isn't very good at protecting against). Don't like kale? Try avocados instead—they're also full of lutein and zeaxanthin.

2. Berries

Thankfully, eating to age gracefully doesn't have to mean cutting out all types of sugar. Some fruits play a major role in keeping skin looking youthful and vibrant. Berries are packed with vitamin C—a common ingredient in anti-aging

THERE'S EVIDENCE THAT GRAPES CAN HELP PROTECT YOUR SKIN FROM CANCER-CAUSING ULTRAVIOLET RADIATION.

skin products—and antioxidants that fight free radicals, which age the skin.

3. Spices

Turns out, your spice cabinet is your next great anti-aging tool. Certain spices, like oregano, cinnamon and cloves, contain lipoic acid—a compound that acts as a powerful antioxidant in the body. Lipoic acid helps stimulate antioxidant production throughout the body and removes heavy metals responsible for oxidative stress. While lipoic acid is naturally present in the body, you can boost your intake through certain foods, like these aromatic spices. We can't talk about inflammation without mentioning turmeric. Turmeric has been used medically in other cultures for centuries to combat and prevent inflammation, and has recently become a popular supplement of choice in the Western world.

4. Watermelon

Everyone's favorite summertime fruit deserves a spot in your anti-aging diet all year long. Watermelon is packed with vitamins A, C and E—which have all been shown to boost skin health—and powerful antioxidants, like lycopene, making it the ultimate food for youthful skin. Watermelon is also seriously hydrating, since it's 92% water. Staying hydrated is essential for keeping your skin glowing and vibrant.

5. Walnuts

Walnuts have the most antioxidant power of any nut and are an excellent source of omega-3 fats. This combination makes them a great inflammation-fighting snack for better skin (and health in general). They're also great for boosting gut health. The health of our microbiome is closely related to skin health, and proper gut health helps the skin stay in homeostasis for optimal protection, temperature regulation and water retention.

6. Grapes

Grapes contain resveratrol (yes, the antioxidant found in red wine), which is known to boost heart health. This antioxidant also protects blood vessels and defends collagen from free radicals. Collagen helps protect the skin's elasticity, so you can stay glowing and vibrant for years to come. Cheers to that!

7. Bone Broth

Bone broth contains plentiful collagen, and that's why you'll want to add it to your diet for a more youthful glow. Although most of the research is on animals, not humans, studies show that consuming collagen may increase some types of skin collagen and also decrease an enzyme that breaks down collagen. Consuming collagen may also help lessen sun-induced dry skin. Meat is also rich in collagen, and be sure to include vitamin C-rich foods, like citrus, kiwi and bell peppers, since vitamin C is important for collagen production.

8. Probiotics

Recent research suggests that some probiotic strains can help prevent or minimize UV-induced skin damage. Other strains have been shown to help maintain a lower skin pH (aging skin has a higher pH) or scavenge for harmful free radicals. But, as with most probiotics, specific strains are required to see benefits, and they aren't always ones that can be found in actual food products. That said, there are so many potential benefits of consuming probiotics in the form of yogurt, kefir, fermented veggies like sauerkraut and kimchi, soy sauce, miso and more that adding them to your diet for skin health won't hurt, even if it's too soon to say they'll make a significant difference for your skin.

9. Coffee

Your cup-a-day habit could help ward off skin cancer and fight rosacea. In a study in the *European Journal of Cancer Prevention*, women who drank a cup of coffee a day reduced their risk of developing nonmelanoma skin cancer by about 10%. It had to be caffeinated, though, since decaf wasn't associated with the same protective benefits. Also, the more coffee the women drank—up to about six cups per day—the lower their skin-cancer risk. Coffee drinkers are also less likely to get rosacea, according to another study. A perky mind and better skin from our favorite morning ritual? Sounds good to us.

10. Dark Chocolate

Great news, chocolate lovers—dark chocolate offers some serious anti-aging benefits. Cocoa beans, the main ingredient in dark chocolate, is packed with antioxidants that can reduce inflammation from UV exposure, increase circulation and help your skin better retain moisture. This is a winning formula for glowing, healthy skin. Dark chocolate is also rich in magnesium, another inflammation-fighting nutrient. Magnesium reduces stress and improves sleep duration and quality, which plays a role in skin aging. Just be sure to check the added sugar content of your favorite dark chocolate bar—too much sugar could wreak havoc on your skin. Research from Baylor University College of Medicine has shown that sugar has a negative effect on collagen fibers and can cause skin to appear stiffer and less elastic.

11. Pomegranates

Pomegranates—and raspberries—are packed with ellagic acid, a compound that research shows could naturally help prevent wrinkles from forming. A study published in *Experimental Dermatology* found that ellagic acid prevents the breakdown of skin-firming collagen, and also prevents some UV-induced inflammation. Thus, ellagic acid can slow the chain of skin-aging reactions that occur as a result of that inflammation.

12. Salmon

Those good-for-you omega-3s in salmon and other fatty fish, like tuna and sardines (plus some shellfish like oysters and mussels), could help you stay looking young and may even save you from a sunburn. Don't ditch the sunscreen altogether, but research indicates that omega-3s quell inflammation that flares up in your skin after UV exposure, and also act like a natural sunblock, helping prevent sunburn. Omega-3s are beneficial not only to your skin but also to your heart. ●

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BE MINDFUL OF HOW MUCH SUGAR AND CREAM YOU'RE ADDING TO YOUR COFFEE, SINCE SUCH ADD-INS COULD START TO NEGATE SOME OF THE BENEFICIAL EFFECTS OF YOUR CUP

THE COLLAGEN QUESTION

What it does—and are all those products worth it?

BY BRIERLEY HORTON, M.S., R.D.

It's in our bones, our teeth and our muscles, and it makes up about 75% of our skin. We're talking about collagen, a protein that acts like scaffolding supporting tissues in the body. With age, collagen begins to break down, and we lose about 1% of it each year starting in our 20s, with a rapid decrease after menopause. (Smoking and UV exposure also worsen this.) The theory behind taking collagen supplements is that you can slow that loss and the signs of aging that come with it.

These products tout all kinds of benefits, in addition to keeping your skin looking youthful: helping you recover faster from injury, keeping your joints less creaky and promoting heart health, muscle strength, strong bones and a happy gut. And the message has clearly spread. Collagen products—which include more than just pills, branching into powder mix-ins, coffee creamers, snack bars and bone broth—are H-U-G-E these days. By 2027, the industry is predicted to be worth $7.5 billion globally. But does science support this boom?

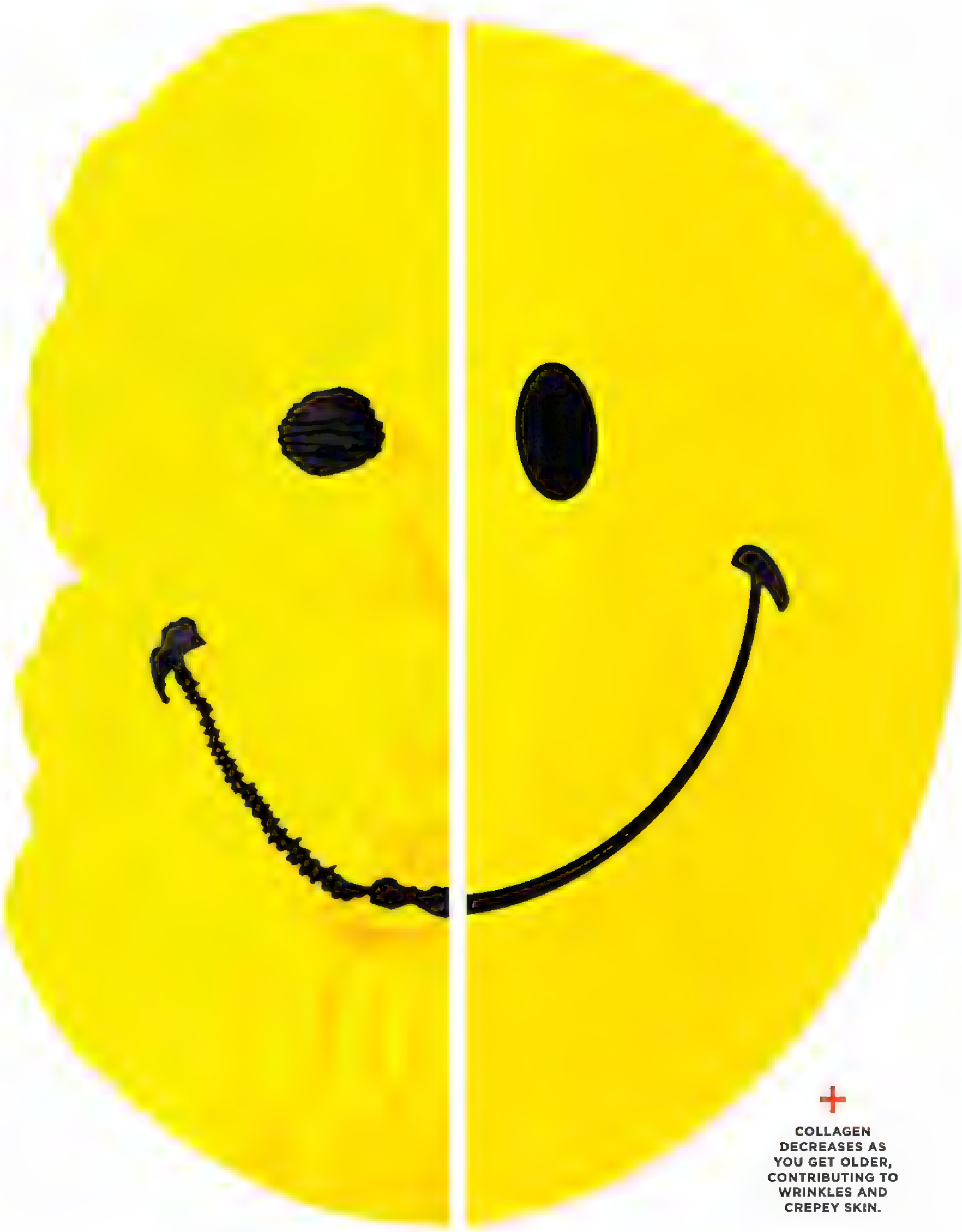
There is some compelling evidence around taking collagen supplements for your skin. In a study published in the journal *Alternative Therapies*, women who took a collagen supplement twice daily for three months significantly reduced their fine lines, wrinkles and crow's feet (measured using various skin scans as well as subjective reports) versus those who took a placebo. Similarly, scientists at the University of California, Irvine, conducted a review of 11 studies on collagen and skin health and concluded that taking oral collagen appears beneficial for anti-aging (and wound healing).

As for other perks, the research is strongest for joint health, suggesting that collagen supplementation may lessen stiffness and pain and could help protect cartilage from wear and tear. When college athletes took a collagen supplement for 12 weeks, they reported less joint pain during regular exercise than those who did not take it. They also bounced back faster with fewer post-workout recovery treatments. Other research, including a review published in *International Orthopaedics*, found that when people with osteoarthritis took collagen supplements, their joint stiffness improved.

The rest of the purported benefits are supported by a smattering of encouraging studies, but the body of evidence is far too small to make health recommendations. (One claim to be particularly wary of: healing leaky gut. There isn't any real research to show that collagen can repair your intestines.)

As for drawbacks, the biggest one is the expense. Because collagen doesn't build up in your system, you need it regularly, and it's a supplement that's on the pricier side. Plus, because supplements in general are poorly regulated, it can be hard to know exactly what you're getting. Safety-wise, though, there isn't any research that suggests taking collagen is harmful (although it's a good idea to talk with your health care team before starting any supplement). And know that many collagen supplements aren't vegan- or vegetarian-friendly.

The trickiest part is knowing the right dose to take, since the amounts used vary from study to study. Your best bet is to talk to a specialist (like a dermatologist or a sports medicine doctor) to see how much you may need. ●



COLLAGEN DECREASES AS YOU GET OLDER, CONTRIBUTING TO WRINKLES AND CREPEY SKIN.

ONE SIZE DOES NOT FIT ALL

Your genes play a huge role in how your skin ages. Understanding the variations could make all the difference in maintaining a glowing complexion.

BY DEANNA PAI

From your eye color to your shoe size, your genes determine a lot of things about how you look. But their influence reaches far beyond the obvious. In fact, genetics play an outsize role in both how and when your skin ages, so much so that your ethnic background can help provide clues to what the aging process will look like for your complexion.

Let's start with the aging process in general. "There are two types of aging of the skin," says Erum Ilyas, M.D., a dermatologist in King of Prussia, Pennsylvania, and a member of the Skin of Color Specialty Clinic at Schweiger Dermatology. First up is intrinsic aging. This is the natural oxidative stress that builds over time throughout the body and affects every organ, from your skin to your heart to your liver.

With intrinsic aging, changes in skin are inevitable, says Ilyas. It's that unavoidable wear and tear that happens to everyone: skin becomes a little thinner, starts to sag a bit due to the loss of fatty tissue in the face, and develops fine lines. No one is excused from the gradual breakdown of collagen and elastin.

Extrinsic aging, on the other hand, is caused by external factors. You have more control over these, for better or for worse. "That's the amount of sun exposure you get, what you eat and how much you exercise," says Ilyas. "You'll start to see lots of freckles, discoloration, broken blood vessels, dark spots and this general loss of elasticity of the skin."

Sun exposure in particular is responsible for a disproportionate amount of this extrinsic aging. A 2013 study published in *Clinical, Cosmetic, and Investigative Dermatology* concluded that sun exposure accounts for a staggering 80% of signs

of skin aging on the face, including wrinkles, discoloration and sagging skin.

But that doesn't mean it's an even playing field, since certain factors can influence how your skin responds to these sources of extrinsic aging. One of the biggest is your skin tone, which is determined by the amount of melanin, or pigment, in your skin. The more melanin you have, the better off you are in some respects. Namely, "the melanin in the skin provides some inherent photoprotection, leading to delayed aging," says Heather Woolery-Lloyd, M.D., a dermatologist and a member of Skin of Color Society.

Fair skin, with less melanin, lacks this natural sun protection. That can move up the aging timeline; for those with lighter skin, "early signs of photoaging start when patients are in their 30s," says Woolery-Lloyd. "These include fine lines, mottled pigmentation and textural changes." Even if you've been diligent about sun protection as an adult, much of the damage is already done by the time you start seeing it. In fact, says Ilyas, most of the sun damage happens in people when they're younger and simply goes unseen—until you reach a certain age, that is. Also complicating matters: fair skin tends to be thin, structurally speaking. "There's less collagen support and a thinning of the dermis itself, which is the part that holds the collagen in our skin," Ilyas explains. "That makes it more susceptible to damage and shows the impact of sun damage a lot more quickly."

Finally, there's the matter of moisture within the skin—or, depending on your genealogy, the lack thereof. Your skin's own sources of hydration, such as hyaluronic acid, take a nosedive over the years, leading to dry, rough skin. While this is an example of intrinsic aging at work, its impact on skin can still vary across ethnicity. Fair skin tends to be drier by nature, and the reduction of moisture over time may only make that worse.

Conversely, for those with Asian, Hispanic and African backgrounds, "there's a little bit more of a thickness of the dermis that allows it to withstand some of those forces from the outside," says Ilyas. They also tend to have a generally higher rate of sebum production—sebum being the waxy substance that serves as the skin's built-in moisturizer and replenishes the skin barrier. That can make skin more resilient, serving as extra protection against external factors like, yes, sunlight, but also pollution, temperature swings and other common environmental stressors.

While skin of color becomes thinner with age, too, the effect is a lot less pronounced than in fair skin. That's because the fibroblasts, which are cells tasked with producing collagen and helping to heal wounds, are typically larger and more active in darker skin tones. "That's probably part of the reason why wrinkling is happening at a later timepoint in this population," says Neelam Vashi, M.D., an associate professor of dermatology at Boston University School of Medicine and the director of the Boston University Cosmetic and Laser Center at Boston Medical Center. "It'll eventually happen, but it'll be 10 years after their white or Caucasian counterparts."

Although there are obvious advantages for people of color in that respect, it doesn't mean they're exempt from all early signs of skin aging. They're just prone to other things—namely, pigmentary issues. "Darker skin is more likely to have hyperpigmentation or dark spots," says Vashi. It's the downside of having a lot of melanin in skin. When there's more melanin, the melanocytes—the cells that produce pigment—are more active. Anything from sun exposure to a zit can cause the pigment production process to go haywire and, in some cases, produce too much melanin, explains Vashi. That can lead to dark spots and a generally uneven skin tone. And while these can fade over time, she says, it takes a lot longer than it would in someone with fairer skin. Clearly, one size doesn't fit all when it comes to skin health. The good news? Just understanding the differences can help you better optimize your skin-care routine accordingly.

Anti-Aging for All

This might not come as a shock, but sunscreen is the best possible anti-aging product out there—for everyone. "You need to be always thinking about how to protect your skin throughout the year," says Ilyas. "Not just in the summer days, not just when you're at the beach, but every single day, just to delay or prevent that extrinsic aging from kicking in." (It should go without saying that it's also essential for skin-cancer prevention.)

RESEARCHERS SUGGEST USING A SUNSCREEN OF SPF 30 DAILY TO IMPROVE SIGNS OF FACIAL AGING, SUCH AS SKIN TEXTURE.

Speaking of: even with that inherent sun protection, people with darker skin tones are still at risk for skin cancer—despite the common (and inaccurate) belief that having dark skin means you can't get it. According to a paper published in *Photochemical Photobiology*, melanin in skin clocks in at just SPF 4, which isn't nearly enough sun protection. "People of color have never been told that skin cancer is a possibility, and most of them are diagnosed later than earlier," says Ilyas. "Oftentimes, you'll see them come in with a spot that's already bleeding on their nose or something along those lines, where they just didn't even think it could be cancer." But it really is a possibility, no matter your background—so it's worth defending yourself accordingly.

Another universal step is to maintain moisture in skin. Despite the plentiful sebum found in darker skin tones, "dryness is common in all skin types with age," says Woolery-Lloyd. "So moisturizers and gentle cleansers become very important." You just need to choose which one works best for your skin type, she adds; for instance, a lightweight lotion might do the trick if your skin is on the oily side, whereas someone with very dry skin may want to opt for a richer, emollient-packed cream.

Beyond cleanser, moisturizer and sunscreen, you can customize your skin-care routine based on the concerns unique to your background. "If you have darker skin and are more concerned about dark spots or uneven skin tone, you might choose a dark spot corrector at night," says Woolery-Lloyd. "If you have lighter skin and are concerned about fine lines, you might go with a retinol night cream."

That said, keep in mind that it's not always so straightforward. "There's a bit of a balancing act," says Ilyas. "If I have a patient who's half-Irish and half-Iranian, they flush and blush and they're oily." And since multiracial children are the fastest growing youth group in the United States, this nuanced approach is only going to become more common.

Plus, your ethnicity isn't the only thing that should dictate your skin-care routine. "I focus on saying, 'What bothers you about your skin? Let's focus on that and finding the ingredient to help you with that,'" says Ilyas. Because while your genetics can certainly point you in the right direction, your personal skin concerns and goals can help you further navigate the way to healthy, radiant skin. ●

MEAL PLAN

7-DAY MEAL PLAN FOR GLOWING SKIN

This weeklong meal plan incorporates foods that decrease inflammation while improving your skin from the inside out.

MEAL PLAN BY EMILY LACHTRUPP, M.S., R.D., C.D.

How to Meal-Prep for the Week

1. Prepare Peanut Butter-Oat Energy Balls (page 74) to have as snacks throughout the week.

2. Prepare Mediterranean Lettuce Wraps (page 72) to have for lunch on Days 2, 3, 4 and 5.

3. Prepare Easy Loaded Baked Omelet Muffins (page 68) to have for breakfast on Days 2 and 4.

4. Prepare 2 hard-boiled eggs to have with breakfast on Days 1 and 6.

CHIA SEEDS LEND THIS CREAMY SMOOTHIE A HEART-HEALTHY PUNCH OF FIBER AND OMEGA-3 FATTY ACIDS.

DAY 1

Breakfast

420 CALORIES

Really Green Smoothie

ACTIVE: 5 min **TOTAL:** 5 min
SERVES: 1

- 1 large ripe banana
- 1 cup packed baby kale or coarsely chopped mature kale
- 1 cup unsweetened vanilla almond milk
- ¼ ripe avocado
- 1 tablespoon chia seeds
- 2 teaspoons honey
- 1 cup ice cubes

Combine banana, kale, almond milk, avocado, chia seeds and honey in a blender. Blend on high until creamy and smooth. Add ice and blend until smooth.

SERVE WITH

- 1 hard-boiled egg

A.M. Snack

170 CALORIES

- ¼ cup walnut halves
- ¼ cup fresh raspberries

Lunch

430 CALORIES

Mason Jar Power Salad with Chickpeas & Tuna

ACTIVE: 5 min **TOTAL:** 5 min
SERVES: 1

- 3 cups bite-size pieces chopped kale
- 2 tablespoons honey-mustard vinaigrette *(see recipe on EatingWell.com)*
- 1 2.5-ounce pouch tuna in water
- ½ cup rinsed canned chickpeas
- 1 carrot, peeled and shredded

1. Toss kale and dressing in a bowl, then transfer to a 1-quart mason jar. Top with tuna, chickpeas and carrot. Screw lid onto the jar and refrigerate for up to 2 days.
2. To serve, empty the jar into a bowl and toss to combine the salad ingredients with the dressed kale.

P.M. Snack

235 CALORIES

- 1 small apple
- 1½ tablespoons natural peanut butter

Dinner

529 CALORIES

Roasted Pistachio-Crusted Salmon with Broccoli

ACTIVE: 30 min **TOTAL:** 45 min
SERVES: 4

- 8 cups broccoli florets with 2-inch stalks attached
- 2 cloves garlic, sliced
- 3 tablespoons extra-virgin olive oil, divided
- ¾ teaspoon salt, divided
- ½ teaspoon ground pepper, divided
- ½ cup salted pistachios, coarsely chopped
- 2 tablespoons chopped fresh chives
- Zest of 1 medium lemon, plus wedges for serving
- 4 teaspoons mayonnaise
- 1¼ pounds salmon fillet, cut into 4 portions

1. Preheat oven to 425°F. Coat a large rimmed baking sheet with cooking spray.
2. Combine broccoli, garlic, 2 tablespoons oil, ½ teaspoon salt and ¼ teaspoon pepper on the prepared pan. Roast for 5 minutes.
3. Meanwhile, combine pistachios, chives, lemon zest, the remaining 1 tablespoon oil and ¼ teaspoon each salt and pepper in a small bowl. Spread 1 teaspoon mayonnaise over each salmon portion and top with the pistachio mixture.
4. Move the broccoli to one side of the baking sheet and place the salmon on the empty side. Roast until the salmon is opaque in the center and the broccoli is just tender, 8 to 15 minutes more, depending on thickness. Serve with lemon wedges, if desired.

SERVE WITH

Basic Quinoa

ACTIVE: 5 min **TOTAL:** 30 min
SERVES: 6

- 2 cups water or broth
- 1 cup quinoa

Combine water (or broth) and quinoa in a medium saucepan. Bring to a boil. Reduce heat to low, cover and simmer until tender and most of the liquid has been absorbed, 15 to 20 minutes. Fluff with a fork.

DAILY TOTALS: CAL 1,793 **FAT** 99G **CHOL** 77MG **CARBS** 148G **PROTEIN** 88G **FIBER** 36G **SODIUM** 1,482MG

DAY 2

Breakfast

363 CALORIES

Easy Loaded Baked Omelet Muffins

ACTIVE: 25 min **TOTAL:** 1 hr
SERVES: 6

- 3 slices bacon, chopped
- 2 cups finely chopped broccoli
- 4 scallions, sliced
- 8 large eggs
- 1 cup shredded Cheddar cheese
- ½ cup low-fat milk
- ½ teaspoon salt
- ½ teaspoon ground pepper

1. Preheat oven to 325°F. Coat a 12-cup muffin tin with cooking spray.
2. Cook bacon in a large skillet over medium heat until crisp, 4 to 5 minutes. Remove with a slotted spoon to a paper towel-lined plate, leaving the bacon fat in the pan. Add broccoli and scallions and cook, stirring, until soft, about 5 minutes. Remove from heat and let cool for 5 minutes.
3. Meanwhile, whisk eggs, cheese, milk, salt and pepper in a large bowl. Stir in the bacon and broccoli mixture. Divide the egg mixture among the prepared muffin cups.
4. Bake until firm to the touch, 25 to 30 minutes. Let stand for 5 minutes before removing from the muffin tin.

SERVE WITH

- 1 slice whole-wheat bread, toasted
- ¼ avocado, mashed

Spread mashed avocado over toast and sprinkle with a pinch of salt and pepper.

A.M. Snack

64 CALORIES

- 1 cup fresh raspberries

Lunch

498 CALORIES

- Mediterranean Lettuce Wraps (page 72)

P.M. Snack

206 CALORIES

- ¼ cup unsalted almonds

Dinner

644 CALORIES

Thai Yellow Chicken Curry

ACTIVE: 30 min **TOTAL:** 30 min
SERVES: 4

- 2 cups water
- 1 cup basmati or jasmine rice
- 2 tablespoons Thai yellow curry paste
- 2 tablespoons peanut oil
- 1 pound boneless, skinless chicken thighs, cut into 1-inch pieces
- 4 cups green beans, trimmed and halved (about 12 ounces)

- **1 medium yellow onion, cut into 1-inch pieces**
- **1 medium red bell pepper, cut into 1-inch pieces**
- **1 15-ounce can unsweetened coconut milk**
- **1 tablespoon fish sauce**
- **¼ cup chopped fresh cilantro**
- **¼ cup chopped, unsalted dry-roasted peanuts**
- **1 lime, quartered**

1. Bring water to a boil in a large saucepan. Add rice, cover and reduce heat to low. Cook until the water is absorbed, about 20 minutes.

2. Meanwhile, whisk curry paste and oil in a large pot. Cook over medium-high heat, stirring, until it sizzles, 1 to 2 minutes. Add chicken and cook, stirring occasionally, until starting to brown, 3 to 5 minutes.

3. Add green beans, onion, bell pepper, coconut milk and fish sauce. Cover and bring to a boil. Reduce heat to a simmer, and cook, covered, until the chicken is cooked through and the vegetables are tender, 8 to 10 minutes.

4. Serve the curry over the rice, topped with cilantro, peanuts and lime wedges.

SERVE WITH

- Citrus-Arugula Salad (page 70)

Meal-Prep Tip: Prepare Berry Chia Pudding (page 70) tonight to have for breakfast tomorrow.

DAILY TOTALS: CAL 1,775 **FAT** 105G **CHOL** 77MG **CARBS** 141G **PROTEIN** 72G **FIBER** 33G **SODIUM** 2,146MG

DAY 3

Breakfast

343 CALORIES

Berry Chia Pudding

ACTIVE: 5 min **TOTAL:** 8 hrs 5 min
SERVES: 2

- 1¾ cups blackberries, raspberries and/or diced mango (fresh or frozen), divided
- 1 cup unsweetened almond milk or milk of choice
- ¼ cup chia seeds
- 1 tablespoon pure maple syrup
- ¾ teaspoon vanilla extract
- ½ cup whole-milk plain Greek yogurt
- ¼ cup granola

1. Puree 1¼ cups fruit and milk in a blender or food processor until smooth. Scrape into a medium bowl; mix in chia, syrup and vanilla. Cover and refrigerate for at least 8 hours and up to 3 days.
2. Divide the pudding between 2 bowls, layering each serving with ¼ cup of the remaining fruit, ¼ cup yogurt and 2 tablespoons granola.

Snack

241 CALORIES

- 1 serving Peanut Butter-Oat Energy Balls (page 74)
- 1 medium apple

Lunch

498 CALORIES

- 1 serving Mediterranean Lettuce Wraps (page 72)

Snack

61 CALORIES

- 2 plums

Dinner

643 CALORIES

Shrimp Poke

ACTIVE: 30 min **TOTAL:** 30 min
SERVES: 4

- ¾ cup thinly sliced scallion greens
- ¼ cup reduced-sodium tamari
- 1½ tablespoons mirin
- 1½ tablespoons toasted (dark) sesame oil
- 1 tablespoon white sesame seeds
- 2 teaspoons grated fresh ginger
- ½ teaspoon crushed red pepper (optional)
- 12 ounces cooked shrimp, cut into ½-inch pieces
- 2 cups cooked brown rice
- 2 tablespoons rice vinegar
- 2 cups sliced cherry tomatoes
- 2 cups diced avocado
- ¼ cup chopped cilantro
- ¼ cup toasted black sesame seeds

1. Whisk scallion greens, tamari, mirin, oil, white sesame seeds, ginger and crushed red pepper, if using, in a medium bowl. Set aside 2 tablespoons of the sauce in a small bowl. Add shrimp to the sauce in the medium bowl and gently toss to coat.
2. Combine rice and vinegar in a large bowl. Divide among 4 bowls and top each with ¾ cup shrimp, ½ cup each tomatoes and avocado, and 1 tablespoon each cilantro and black sesame seeds. Drizzle with the reserved sauce and serve.

SERVE WITH

Citrus-Arugula Salad

ACTIVE: 10 min **TOTAL:** 10 min
SERVES: 4

- 2 small tangerines, peeled and sliced
- 1 medium blood orange, peeled and sliced
- 3 cups packed baby arugula
- 2 tablespoons lime juice
- 2 tablespoons extra-virgin olive oil
- 1 tablespoon chopped fresh tarragon
- 2 teaspoons finely chopped jalapeño
- ¼ teaspoon salt
- 1 chopped avocado

Combine tangerines, orange, arugula, lime juice, oil, tarragon, jalapeño and salt in a medium bowl. Gently stir in avocado.

DAILY TOTALS: CAL 1,786 **FAT** 87G **CHOL** 77MG **CARBS** 198G **PROTEIN** 66G **FIBER** 49G **SODIUM** 1,744MG

DAY 4

Breakfast

383 CALORIES

- 1 serving Easy Loaded Baked Omelet Muffins (page 68)
- 1 slice whole-wheat bread, toasted
- ¼ avocado, mashed

Spread mashed avocado over toast and sprinkle with a pinch of salt and pepper.

A.M. Snack

222 CALORIES

- ¼ cup walnut halves
- 1 medium peach

Lunch

458 CALORIES

- 1 serving Mediterranean Lettuce Wraps (page 72)

P.M. Snack

147 CALORIES

- 2 servings Peanut Butter-Oat Energy Balls (page 74)

Dinner

585 CALORIES

Spaghetti Squash with Roasted Tomatoes, Beans & Almond Pesto

ACTIVE: 45 min **TOTAL:** 45 min
SERVES: 4

Almond Pesto

- 2 cups fresh basil leaves
- 1 cup fresh parsley leaves
- ½ cup grated Parmesan cheese
- ⅓ cup whole raw almonds
- 1 clove garlic
- 1½ tablespoons red-wine vinegar
- ¼ teaspoon kosher salt
- ¼ teaspoon ground pepper
- ¼ cup extra-virgin olive oil
- ¼ cup water

Spaghetti Squash & Vegetables

- 1 3-pound spaghetti squash
- ¼ cup water
- 2 pints grape tomatoes, halved
- 1 tablespoon extra-virgin olive oil
- ¼ teaspoon kosher salt
- ¼ teaspoon ground pepper
- 1 cup canned cannellini beans, rinsed

1. To prepare pesto: Pulse basil, parsley, Parmesan, almonds, garlic, vinegar and ¼ teaspoon each salt and pepper in a food processor until coarsely chopped, scraping down the sides. With the motor running, add ¼ cup oil; process until well combined. Add water; pulse to combine.

2. To prepare squash & vegetables: Preheat oven to 400°F. Line a rimmed baking sheet with foil.

3. Halve squash lengthwise and scoop out the seeds. Place cut-side down in a microwave-safe dish and add water. Microwave on High until the flesh can be easily scraped with a fork, about 15 minutes.

4. Meanwhile, toss tomatoes with oil, salt and pepper in a large bowl. Transfer to the prepared pan. Roast until soft and wrinkled, 10 to 12 minutes. Remove from oven. Add beans and stir to combine.

5. Scrape the squash flesh into the bowl and divide among 4 plates. Top each portion with some of the tomato-bean mixture and about 3 tablespoons pesto sauce.

SERVE WITH

- 1 serving Massaged Kale Salad *(see recipe on EatingWell.com)*

DAILY TOTALS: CAL 1,813 **FAT** 115G **CHOL** 77MG **CARBS** 149G **PROTEIN** 62G **FIBER** 36G **SODIUM** 2,199MG

DAY 5

Breakfast

371 CALORIES

- 1 cup whole-milk plain Greek yogurt
- 2 tablespoons sliced almonds
- ¼ cup blueberries
- Top yogurt with almonds and blueberries.

Snack

225 CALORIES

- 1 small apple
- 1½ tablespoons natural peanut butter

Lunch

498 CALORIES

Mediterranean Lettuce Wraps

ACTIVE: 10 min **TOTAL:** 10 min
SERVES: 4

- ¼ cup tahini
- ¼ cup extra-virgin olive oil
- 1 teaspoon lemon zest
- ¼ cup lemon juice (from 2 lemons)
- 1½ teaspoons pure maple syrup
- ¾ teaspoon kosher salt
- ½ teaspoon paprika
- 2 15-ounce cans no-salt-added chickpeas, rinsed
- ½ cup sliced jarred roasted red peppers, drained
- ½ cup thinly sliced shallots
- 12 large Bibb lettuce leaves
- ¼ cup toasted almonds, chopped
- 2 tablespoons chopped fresh parsley

1. Whisk tahini, oil, lemon zest, lemon juice, maple syrup, salt and paprika in a large bowl. Add chickpeas, peppers and shallots. Toss to coat.
2. Divide the mixture among lettuce leaves (about ⅓ cup each). Top with almonds and parsley. Wrap the lettuce leaves around the filling and serve.

Snack

128 CALORIES

- 2 medium carrots
- 3 tablespoons hummus

Dinner

488 CALORIES

Guacamole Chicken

ACTIVE: 30 min **TOTAL:** 40 min
SERVES: 4

- 1 medium avocado
- 2 teaspoons chopped pimientos
- 1 teaspoon lime juice
- Pinch of salt plus ½ teaspoon, divided
- Pinch of ground pepper plus ½ teaspoon, divided
- 2 8-ounce boneless, skinless chicken breasts, halved
- ½ teaspoon garlic powder
- 1 tablespoon extra-virgin olive oil
- ½ cup shredded Monterey Jack cheese (1 ounce)
- 2 tablespoons chopped fresh cilantro

1. Place avocado in a medium bowl; mash with a fork until smooth with some chunks remaining. Stir in pimientos, lime juice, a pinch of salt and a pinch of pepper. Set aside.
2. Sprinkle chicken with the remaining ½ teaspoon each salt and pepper and garlic powder. Heat oil in a large skillet over medium-high heat. Add the chicken and reduce heat to medium. Cook, turning once, until just cooked through, 4 to 6 minutes per side. Top with cheese; cover and continue cooking until the cheese has melted, about 2 minutes more.
3. Transfer the chicken to a serving platter and top with the guacamole. Garnish with cilantro.

AVOCADOS ARE HIGH IN BENEFICIAL FATS AND CONTAIN VITAMINS E AND C, WHICH ARE IMPORTANT FOR HEALTHY SKIN.

SERVE WITH

No-Cook Black Bean Salad

ACTIVE: 30 min **TOTAL:** 30 min
SERVES: 4

- ½ cup thinly sliced red onion
- 1 medium ripe avocado, peeled, pitted and roughly chopped
- ¼ cup fresh cilantro leaves
- ¼ cup lime juice
- 2 tablespoons extra-virgin olive oil
- 1 clove garlic, minced
- ½ teaspoon salt
- 8 cups mixed salad greens
- 2 medium ears corn, kernels removed, or 2 cups frozen corn, thawed and patted dry
- 1 pint grape tomatoes, halved
- 1 15-ounce can black beans, rinsed

1. Place onion in a medium bowl and cover with cold water. Set aside. Combine avocado, cilantro, lime juice, oil, garlic and salt in a mini food processor. Process, scraping down the sides as needed, until smooth and creamy.

2. Just before serving, combine salad greens, corn, tomatoes and beans in a large bowl. Drain the onion and add to the bowl, along with the avocado dressing. Toss to coat.

DAILY TOTALS: CAL 1,817 **FAT** 99G **CHOL** 77MG **CARBS** 152G **PROTEIN** 89G **FIBER** 40G **SODIUM** 1,834MG

FOR THE BEST FLAVOR AND TEXTURE, USE MEDJOOL DATES, THE LARGEST AND MOST LUSCIOUS DATE VARIETY.

DAY 6

Breakfast

420 CALORIES

- 1 serving Really Green Smoothie (page 67)
- 1 hard-boiled egg

Snack

265 CALORIES

- ¼ cup unsalted almonds
- 1 medium peach

Lunch

491 CALORIES

West Coast Avocado Toast

ACTIVE: 10 min **TOTAL:** 10 min
SERVES: 1

- **1 cup mixed salad greens**
- **1 teaspoon red-wine vinegar**
- **1 teaspoon extra-virgin olive oil**
- **Pinch of salt**
- **Pinch of ground pepper**
- **2 slices sprouted whole-wheat bread, toasted**
- **¼ cup plain hummus**
- **¼ cup alfalfa sprouts**
- **¼ avocado, sliced**
- **2 teaspoons unsalted sunflower seeds**

Toss greens with vinegar, oil, salt and pepper in a medium bowl. Spread each slice of toast with 2 tablespoons hummus. Top with sprouts, avocado and the greens and sprinkle with sunflower seeds.

SERVE WITH

- 1 medium orange

Snack

147 CALORIES

Peanut Butter-Oat Energy Balls

ACTIVE: 15 min **TOTAL:** 30 min
SERVES: 12

- **¾ cup chopped Medjool dates**
- **½ cup rolled oats**
- **¼ cup natural peanut butter**
- **Chia seeds for garnish**

1. Soak dates in a small bowl of hot water for 5 to 10 minutes. Drain.
2. Combine the soaked dates, oats and peanut butter in a food processor and process until very finely chopped. Roll into 12 balls (a scant tablespoon each). Garnish with chia seeds, if desired. Refrigerate for at least 15 minutes and up to 1 week.

Dinner

472 CALORIES

Stuffed Sweet Potato with Hummus Dressing

ACTIVE: 15 min **TOTAL:** 20 min
SERVES: 1

- **1 large sweet potato, scrubbed**
- **¾ cup chopped kale**
- **1 cup canned black beans, rinsed**
- **¼ cup hummus**
- **2 tablespoons water**

1. Prick sweet potato all over with a fork. Microwave on High until cooked through, 7 to 10 minutes.
2. Meanwhile, wash kale and drain, allowing water to cling to the leaves. Place in a medium saucepan; cover and cook over medium-high heat, stirring once or twice, until wilted. Add beans; add a tablespoon or two of water if the pot is dry. Continue cooking, uncovered, stirring occasionally, until the mixture is steaming hot, 1 to 2 minutes.
3. Split the sweet potato open and top with the kale and bean mixture. Combine hummus and 2 tablespoons water in a small dish. Add additional water as needed to reach desired consistency. Drizzle the hummus dressing over the stuffed sweet potato.

Meal-Prep Tip: Prepare Berry Chia Pudding (page 70) tonight to have for breakfast tomorrow.

DAILY TOTALS: CAL 1,795 **FAT** 73G **CHOL** 77MG **CARBS** 244G **PROTEIN** 63G **FIBER** 61G **SODIUM** 1,337MG

DAY 7

Breakfast

343 CALORIES

- 1 serving Berry Chia Pudding (page 70)

Snack

223 CALORIES

- 2 celery stalks
- 2 tablespoons natural peanut butter

Lunch

494 CALORIES

- 1 serving Mason Jar Power Salad with Chickpeas & Tuna (page 67)
- 1 cup fresh raspberries

Snack

237 CALORIES

- ¼ cup unsalted almonds
- 1 plum

Dinner

507 CALORIES

Hummus-Crusted Chicken

ACTIVE: 5 min **TOTAL:** 30 min
SERVES: 4

- **⅔ cup prepared hummus**
- **1 teaspoon ground cumin**
- **1 teaspoon lemon zest**
- **½ teaspoon paprika**
- **¼ teaspoon salt**
- **½ teaspoon ground pepper**
- **4 6-ounce boneless, skinless chicken breasts**
- **¼ cup toasted sesame seeds**
- **2 tablespoons chopped fresh parsley**
- **Lemon wedges for serving**

1. Preheat oven to 400°F. Line a rimmed baking sheet with foil.
2. Whisk hummus, cumin, lemon zest, paprika, salt and pepper in a small bowl. Spread the mixture evenly on both sides of chicken breasts. Sprinkle both sides with sesame seeds, pressing gently to adhere. Place on the prepared pan.
3. Roast the chicken until an instant-read thermometer inserted in the thickest part registers 160°F, about 20 minutes. Let stand for 5 minutes (the temperature will increase to 165°F). Sprinkle with parsley and serve with lemon wedges.

SERVE WITH

Cauliflower Risotto

ACTIVE: 20 min **TOTAL:** 20 min
SERVES: 4

- **2 tablespoons extra-virgin olive oil**
- **½ cup sliced shallot (about 1 large)**
- **4 cups cauliflower rice, fresh or frozen (thawed)**
- **½ teaspoon ground pepper**
- **¼ teaspoon salt**
- **¾ cup low-sodium chicken broth**
- **¼ cup dry white wine**
- **2 teaspoons cornstarch**
- **½ cup grated Parmesan cheese**
- **2 tablespoons chopped fresh herbs, such as chives, parsley or basil**
- **1 tablespoon butter**

1. Heat oil in a large skillet over medium heat. Add shallot and cook, stirring, until starting to soften, about 2 minutes. Add cauliflower rice, pepper and salt; cook until softened, stirring occasionally, 3 to 6 minutes.
2. Whisk broth, wine and cornstarch in a small bowl and add to the pan. Cook, stirring, until the liquid is creamy and thick, 2 to 3 minutes more. Remove from heat and stir in Parmesan, herbs and butter.

DAILY TOTALS: CAL 1,803 **FAT** 99G **CHOL** 77MG **CARBS** 127G **PROTEIN** 103G **FIBER** 46G **SODIUM** 1,547MG

CHAPTER 4

ACTIVE AT ANY AGE

Getting older doesn't have to sideline you. Here's how you can bolster your energy levels and get moving.

WALK AWAY FROM FATHER TIME

Regular exercise helps people age more slowly and live longer, healthier and more vigorous lives.

BY ASHLEY ABRAMSON

Believe it or not, people didn't always associate exercise with longevity. In the 1960s, Ralph Paffenbarger Jr., an epidemiologist at Harvard, became one of the first researchers to study the link between physical activity and a long life, providing the framework for U.S. federal exercise guidelines. An avid exerciser himself, Paffenbarger had another, equally important observation: exercise doesn't just add years to your life; it can also add life to your years.

Researchers have come a long way since then, and there's more evidence than ever that regular physical movement can both decrease the risk of life-threatening diseases and drastically improve a person's overall function. And while a lifetime of physical activity will only reap positive benefits, experts agree it's never too late to start.

Here's how exercise can improve your longevity and your well-being—and some practical tips for getting started.

How Exercise Promotes Aging with Vigor

These days, it's common knowledge that exercise—even when you start later in life—can help a person live longer. "Many studies indicate that even the most sedentary person starting exercise at 50, 60 or 70 can increase the life span from six months to even seven years, depending on when you start," says Frank Frisch, Ph.D., a professor of health sciences and applied human physiology at Chapman University in Orange, California.

A 2018 study in *Aging Cell* provided a snapshot of how exercise can improve bodily function. Participants ages 55 to 79 who exercised regularly not only didn't lose muscle mass and strength

with age; they also had lower body fat and cholesterol than people who didn't exercise. Most astoundingly, they had as many immune markers as younger people, suggesting aging hadn't affected their immune function.

By boosting the immune system and strengthening organ function, exercise has the potential to reduce the risk for many diseases. Research has linked exercise to a lower risk of heart disease, cancer, diabetes, high blood pressure and depression. It has psychological benefits, too, ranging from reducing stress and improving mood to boosting memory. Some studies even link exercise with a lower risk of Alzheimer's.

In addition to lowering disease risk, exercise can make a person less prone to injury. According to Rachel Goossen, M.D., a clinical attending member of the Family Medicine Division in the department of family and preventive medicine at the University of Utah, exercise can help slow muscle loss and osteoporosis. Weight-bearing exercise, specifically, has been shown to help slow the rate of bone loss. "Think of it how you think of a muscle. You put stress on it, which causes micro-tears, then it rebuilds itself and gets stronger," Goossen says.

Savan Patel, M.D., an orthopedic surgeon specializing in sports medicine at Northwestern Medicine in Crystal Lake, Illinois, says that when bones are stronger due to exercise, people who fall are less likely to break their hips. Improved strength and mobility can also boost functional ability. "That means we can do the activities we enjoy doing, like gardening, traveling or playing with grandkids," says Nancy Gell, an associate professor of exercise science at the University of Vermont.

While Frisch says there's no precise formula for how much to exercise, in general, people who exercise more will benefit more from their physical activity. The Department of Health and Human Services recommends 150 to 300 minutes of moderate exercise a week, but experts agree some exercise is better than none.

Starting an Exercise Routine

Whether you haven't exercised in a while or you're starting for the first time, beginning can feel daunting. The first thing to know: now is the perfect time to get started. "It is never too late for someone to start exercising for the first time," says Gell. "That's the amazing part of the human body: you can always address strength, balance and endurance at any age."

Once you clear an exercise regimen with your doctor, focus on keeping it simple and doable. You don't need a complicated routine to reap the benefits. Patel suggests starting with two areas: weight-bearing exercises, which strengthen muscles and bones, and cardio activities, which support heart health. Signing up for a gym membership can be helpful if you don't have equipment of your own, but there are plenty of exercises you can do at home without expensive gear.

Tracy E.K. Davis, Ph.D., a gerontologist and assistant professor of aging and health promotion at Rutgers University, suggests online exercise videos and walking. And for resistance training, you can DIY with jugs of water or bottles of laundry detergent to use as weights.

For individuals without a lot of exercise experience, Gell recommends an online resource called Move Your Way, created by the Office of Disease Prevention and Health Promotion. "The key to keep in mind as you start is that anything above and beyond what you're already doing will be beneficial," she says. Start with taking breaks from sitting, walking around the house a few times a day, and build your endurance gradually until you feel comfortable with a simple outdoor walking program. Starting slow is key to prevent injuries, but Frisch says building up slowly over time is also more motivating. "It can be daunting when you have a lot of muscle soreness after working out because you did too much too quickly," he says. "I recommend to anyone over 40 to start exercising moderately and work into more time and intensity as you go on."

If you have bone loss, preventing falls is important. Goossen recommends partnering with a physical therapist, many of whom accept insurance for medical indications and are trained to help patients come up with safe exercise programs. A certified personal trainer can be another good resource. "You can get a safe routine from a physical therapist, then find a personal trainer to supervise you through the exercise," says Goossen.

If you're worried about falling, another option is to exercise in groups, like at a gym or a senior center.

Getting the Most Out of Your Exercise Routine

Aging with vigor isn't just about exercise; to stay healthy, you'll also need to integrate proper nutrition into your routine. The right food habits can in turn fuel your exercise habits, resulting in better overall well-being. Nancy Clark, M.S., R.D., C.S.S.D., a Boston-area sports nutritionist and author of *Nancy Clark's Sports Nutrition Guidebook*, says it's important to fuel up with food and fluids before you exercise and refuel after. "You put gas in a car so it goes, and the same is true for food and your body when you're exercising."

Before you work out, focus on complex carbohydrates—whole grains, fruits and vegetables—which your muscles use for energy. Complex carbs also break down into sugar, which Clark says feeds your brain (so you'll actually want to go to the gym or go for a walk). You don't have to eat a lot before you work out. Clark says a packet of oatmeal, a piece of toast or a handful of granola before you exercise—aim for 100 to 200 calories—is enough to get you going.

After a workout, focus on protein in addition to complex carbs, which Clark says helps build and repair muscle. Protein is especially important for aging individuals; too little protein has been linked to muscle loss, which can make exercise difficult (not to mention reduce all-around mobility and strength). In general, Clark suggests eating protein every four hours, which includes each meal and snack. For example, rather than just eating an apple as a snack, add cheese or peanut butter.

Front-loading food, or eating more earlier in the day and less at night, is another good way to fuel your body. "A bigger meal for breakfast means you'll have more energy during the day, so you'll feel better for exercise and other activities," says Clark. On the other hand, if you consume too few calories in the morning, you may end up eating more at night, which perpetuates an unhealthy cycle where you skip breakfast, struggle to get through workouts, then eat too much at night again.

Aim for minimally processed foods: whole grains, fruits, vegetables and your protein of choice, whether meat, eggs or tofu. Make sure, too, to get adequate calcium for bone health and general strength. If you're exercising regularly, don't worry too much about counting calories; instead, focus on food quality and eating when you're hungry and stopping when you're not. "The body is the best calorie counter," says Clark. "If you do a hard workout and you get hungrier, you should eat more."

As you combine nutrition and physical movement, focus on eating and moving in ways you enjoy. For example, Frisch says if you hate push-ups, don't do them, or you'll be more likely to quit prematurely. And if you dread eating salads for every meal, eat nutritious food you love. When you make health fun, you'll be more likely to prioritize it longer—and improve your longevity and age over time. ●

Frail Old Lady? No Way

94-year-old gymnast Johanna Quaas (shown here) proves that the stereotype of the shuffling nonagenarian isn't inevitable. Here, four ways to overpower age-related muscle loss.

BY JULIE STEWART

The secret to staying spry for life is strong muscles, but protecting that strength starts early. As we age, muscle mass and strength naturally begin to decline. After age 40 or so, the average person loses about 1% of their muscle mass and 2% to 3% of their strength annually. Left unchecked, this can lead to sarcopenia, a condition that affects 5% to 10% of 65- to 80-year-olds and half of those in the 80-plus crew. (Think of it as the muscle equivalent of osteoporosis.) So let's all pump up! "It's like a bank account," says Stéphanie Chevalier, Ph.D., R.D., a sarcopenia researcher at McGill University in Montreal. "If you're steadily building up your savings, even if you take a hit later on, you'll still have plenty of money." These proven strategies can help you build—and bank more of—your strength.

WEIGHT IT OUT

To continue the finance metaphor, strength training is your best investment. And you'll get a bigger bang for your buck if you pick up the habit when you're younger, because your body is able to build muscle more efficiently—thanks to factors like higher testosterone production, better nerve function and lower inflammation—says Chevalier.

PRIORITIZE PROTEIN

This nutrient signals your body to build new muscle tissue, but the message gets weaker as you get older, likely due to decreased levels of exercise and protein intake (yes, elders tend to eat less of this macronutrient, plus its effects are lessened, a double whammy). A review published in the journal *Nutrition Research* found that increasing intake to 95 grams daily after age 65 (up from the standard recommended daily allowance of 54 grams for a 150-pound woman) could help you add muscle. Over a day, that's a 1-egg omelet with cheese, a can of tuna and 3 ounces of chicken breast. Younger folks can get away with lower amounts, but everyone should focus on timing: for maximum absorption, evenly spread protein intake throughout your day's meals. (Turn the page for more protein tips.)

MAKE LIKE POPEYE

An Australian study found that older women who ate the most nitrate-rich veggies (the equivalent of 1 cup of raw spinach per day) were 35% less likely to have weak grip strength and 28% less likely to have poor functional mobility compared to women who grazed on less (closer to ⅓ cup). Nitrate—also found in beets, celery, broccoli and other leafy greens—helps your body produce nitric oxide, a compound that promotes muscle contraction and may maximize your workout results.

SLEEP ON IT

Many of the hormones that support muscle growth come out to play at night. "Growth hormone is secreted while you sleep," says Jonathan Cedernaes, M.D., Ph.D., a senior sleep researcher at Uppsala University in Sweden. "But this and levels of other hormones essential for healthy muscles are disrupted when sleep goes awry." His research found that, after a sleepless night, study participants' muscle tissue had markers of inflammation and harbingers of muscle protein breakdown. So make sure you're turning in early enough to muscle through tomorrow. ●

STRENGTH TRAINING HAS BEEN LINKED TO INCREASED BONE DENSITY AND CAN SLOW THE INEVITABLE STRENGTH DECLINE THAT COMES WITH AGE

THE TRUTH ABOUT PROTEIN

Understanding how protein can help with healthy aging and in powering an active lifestyle starts with knowing how much to eat and the best sources to get it.

BY SHAUN DREISBACH

It's the current darling among nutrients. Everyone wants it. Needs it. Can't get enough of it. We're talking, of course, about protein.

Nearly two-thirds of Americans are trying to consume more of the stuff—up significantly from just seven years ago, according to an International Food Information Council survey. And are we ever: the U.S. Department of Agriculture estimates we ate a record amount of red meat and poultry—a whopping 222 pounds per person—in 2018, close to downing a 10-ounce steak every day. Egg and dairy intake also hit an all-time high. (And that's just to name a few protein sources.)

Our collective preoccupation has now reached obsession-level status, in part because it has so many factors driving it. The high-protein diet craze (think paleo, keto, Whole30) has people eschewing foods like root veggies and pasta in favor of All

the Meats. The rise of high-intensity workouts is spurring CrossFitters and Tough Mudders to seek out extra protein to rebuild their spent muscles. Then there's our (unfortunate) continued cultural malaise with carbs and shaky relationship with fat—so, honestly, what else can a person eat? "There are only three macronutrients: carbs, fat and protein. Carbohydrates and fat have come under criticism. That leaves protein as the only one that seems OK. And Americans often believe that if something is good, more is better," says Marion Nestle, Ph.D., M.P.H., Paulette Goddard professor emerita of nutrition, food studies and public health at New York University and *EatingWell* advisory board member. Plus, everyone knows that protein makes you feel fuller longer, which must make it some sort of weight-loss miracle, right? See? Darling.

All of which helps explain why 21% of adults believe they're protein deficient. Even many nutritionists and researchers insist we're not getting enough—and that the recommended daily allowance (RDA) is too low because it represents the minimum required for good health. It calls for 0.36 gram of protein per pound of body weight daily, which works out to be around 46 grams for what's considered the average woman and 56 grams for men—or roughly 10% of your daily calories.

It's true that protein is no nutritional slouch. It is vital for pretty much every cellular function—transporting oxygen through our body, making antibodies that bolster our immune system, forming not just muscles, but also our skin, hair, blood and organs, and creating hormones responsible for things like insulin regulation. And because our bodies don't store protein like they do fat and carbs, we need a steady stream of it from our diet.

Our muscles are literally made of protein, and it is also key for maintaining healthy connective tissue—ligaments, tendons, cartilage—and your bones, which are (surprise) up to 50% protein. Being the pivotal player that it is, here's what you should know.

If You're Over 40

The hormonal changes that can lead to age-related muscle loss—called sarcopenia—begin around this time. In fact, if unchecked, muscle mass naturally declines 3% to 8% per decade. "It becomes harder for muscles to synthesize protein as well as they used to, so your needs tend to be higher," says D. Travis Thomas, Ph.D., R.D.N., C.S.S.D., an associate professor of clinical and sports nutrition at the University of Kentucky. How much higher isn't totally clear, and experts point out that strength training is still the best way to preserve muscle. But a review of studies published in the *American Journal of Clinical Nutrition* found that 0.45 to 0.68 gram of protein per pound of body weight a day helped maintain more lean muscle among older populations.

If You Exercise a Lot

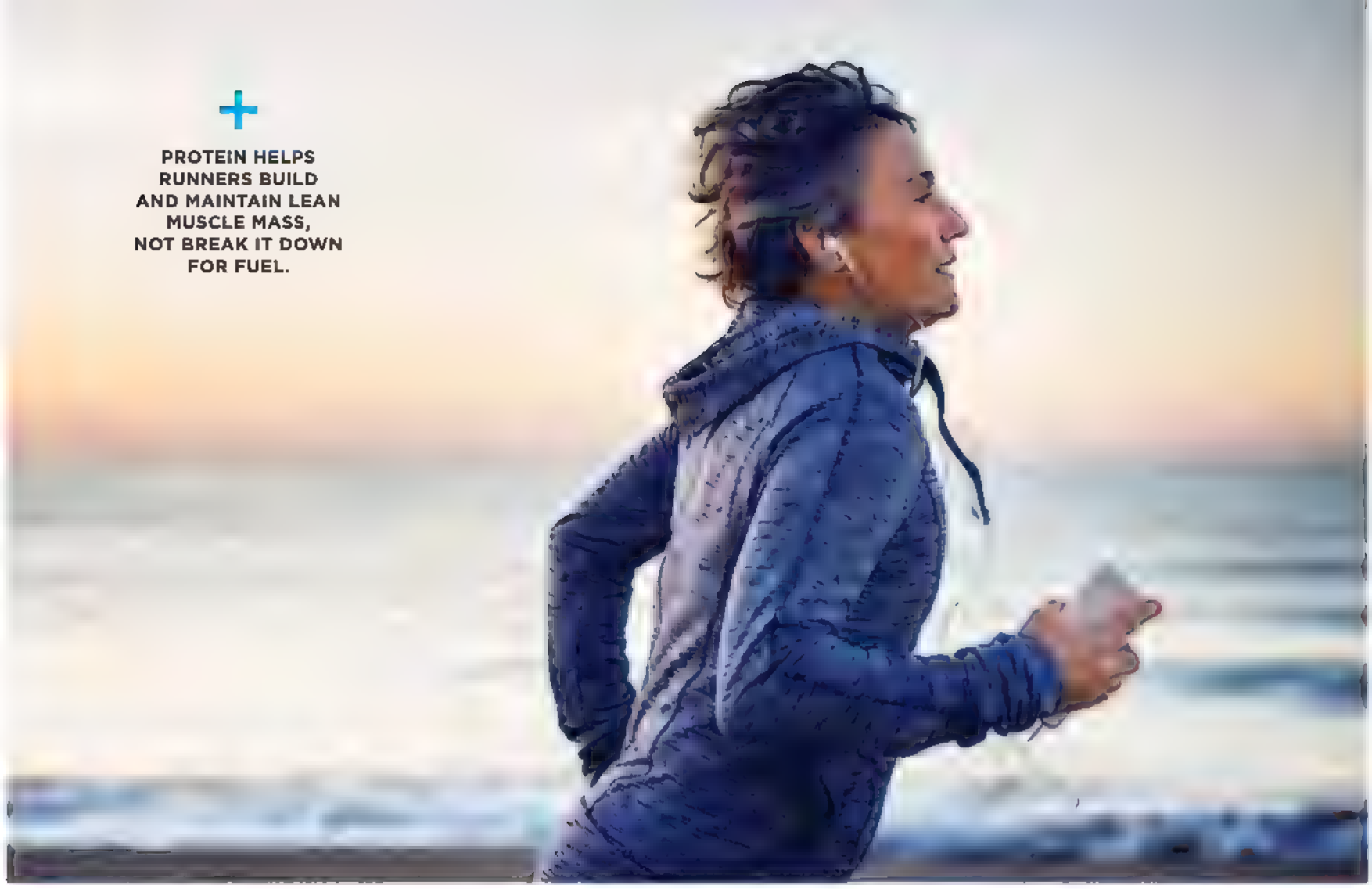
A growing body of research suggests regularly active folks may need more protein than the average Jane—around 0.54 to 0.9 gram per pound of body weight daily—to help repair, build and support muscle, says Thomas, who helped draft the Academy of Nutrition and Dietetics and American College of Sports Medicine's joint guidelines on nutrition and athletic performance. Who qualifies as "active"? Some experts limit it to elite athletes. "But I define it more widely—as anyone who is committed to an exercise program, trains multiple times a week and has a goal for performance or health," he says. The range Thomas and his colleagues settled on is deliberately broad: if you jog four days a week, you'd likely need the lower amount; if you're training for Tokyo 2021, you'd shoot for the high side. That said, if you eat more protein than you need, it won't turn into lean muscle mass; it will be converted to body fat (just like overdoing anything). So balance is key.

If You Skimp on Protein at Breakfast

Most of us do. Nothing wrong with fruit and toast, but studies suggest that muscles respond better to protein when fed a good dose of it divided equally among meals every three to four hours, notes Thomas. If you need 60 grams a day, for example, aiming for 20 each at breakfast, lunch and dinner is better than nibbling only a little early in the day and having a mega meatball sub at 7 p.m.

Is the RDA Too Low?

Our recommended daily allowances were decided by a panel of scientists at the National Academy of Medicine (NAM) and represent the average amount



PROTEIN HELPS RUNNERS BUILD AND MAINTAIN LEAN MUSCLE MASS, NOT BREAK IT DOWN FOR FUEL.

needed to meet the nutrient requirements of nearly all (97% to 98%) of healthy people. Some experts argue that the RDA for protein—which was set more than 70 years ago in a galaxy far, far away—is outdated. "There's a small but vocal group who think something higher would be optimal," says *EatingWell* advisory board member Richard Mattes, Ph.D., M.P.H., R.D., a distinguished professor of nutrition science at Purdue University. "Which isn't to say these people are a fringe element. They are very good researchers that just hold a different belief. These are reasoned opinions." While the exact optimal daily amount varies from study to study, it's generally between 0.45 and 0.9 gram per pound of body weight—or roughly double the RDA. (For the record, there's no established upper limit—an amount beyond which isn't considered safe—for protein.)

Proponents argue that because people's protein needs can vary greatly depending on factors like gender, age, weight and activity level, the current acceptable macronutrient distribution range (or AMDR, also set by the NAM) may be a better benchmark. It suggests a range of protein from 10% to 35% of daily calories—the higher end of which aligns with the amount many in the up-with-extra-protein camp recommend.

But Mattes and most of the experts we spoke with say that the RDA is just fine as is—and point out that most of us are getting way more protein than we need anyway. "This focus on protein is one of the more overhyped misunderstandings in nutrition right now," says Dariush Mozaffarian, M.D., M.P.H, Dr.Ph.D., dean of the Friedman School of Nutrition Science and Policy at Tufts University. "Protein deficiency is almost nonexistent in the United States. And multiple systematic reviews over the last several years have all come to the conclusion that the minimum requirements for protein are reasonable. Having extra helps for building muscle mass. Other than that, there's really no consistent evidence of any health benefit to eating more of it."

The concern he and others do have (and a solid argument for leaving the RDA as is): fixating on protein could seriously throw your diet out of balance. General nutrition wisdom holds that if you eat a ton of one thing, you're bound to crowd out other foods. In the case of protein, amping it up may mean skipping things like fiber-rich whole grains and phytonutrient-packed fruits and veggies. "That's really at the heart of it," says Mattes. "When you take one particular nutrient to an extreme, this by definition means there will be compromised intake of other important nutrients. Otherwise, calories overall go up." Not exactly the healthy diet you were going for, huh?

So don't stress about it. ●

HEALTHY-AGING RECIPES

DINNER IN 25 MINUTES OR LESS

As you get older, fiber, vitamin D, protein and calcium are especially important for keeping your body healthy. These recipes contain at least two or more of these crucial nutrients.

Shrimp Cauliflower Fried Rice

ACTIVE: 25 min **TOTAL:** 25 min

Cut down on carbs and amp up your veggie servings with this healthy cauliflower fried rice with shrimp, broccoli, bell peppers, and garlic. Everything is cooked in one wok or skillet, but in stages, so each element keeps its integrity in the finished dish instead of being all mushed together—it may seem fussy, but it's worth it and actually quite easy. Resist the urge to stir the cauliflower rice right away; letting it cook undisturbed for a few minutes allows it to brown and develop sweet, nutty flavors.

- **¼ cup sesame oil, divided**
- **2 large eggs, lightly beaten**
- **3 cups riced cauliflower *(see Tip)***
- **1 pound large shrimp (31–35 count), peeled and deveined**
- **3 cups broccoli florets**
- **1 medium red bell pepper, thinly sliced (about 1 cup)**
- **3 cloves garlic, sliced**
- **3 tablespoons reduced-sodium soy sauce or tamari**
- **2 tablespoons water**
- **1 tablespoon rice vinegar**
- **½ teaspoon ground pepper**

1. Heat 2 teaspoons oil in a large flat-bottomed carbon-steel wok or large, heavy skillet over high heat. Add eggs and cook, without stirring, until fully cooked on one side, about 30 seconds. Flip and cook until just cooked through, about 15 seconds. Transfer to a cutting board and cut into ½-inch pieces.

2. Add 2 teaspoons oil to the pan; heat over high heat. Add cauliflower in an even layer; cook, undisturbed, until lightly browned, 3 to 4 minutes. Transfer to a plate.

3. Add 2 teaspoons oil to the pan; heat over high heat. Add shrimp; cook, stirring often, until just opaque, about 3 minutes. Transfer to the plate with the cauliflower.

4. Add the remaining 2 tablespoons oil to the pan; heat over high heat. Add broccoli, bell pepper and garlic; cook, stirring occasionally, until lightly charred, 4 to 5 minutes. Stir in soy sauce (or tamari), water, vinegar and pepper. Bring to a boil; boil for 30 seconds. Remove from the heat. Stir in the reserved eggs, cauliflower and shrimp.

SERVES 4: 1½ CUPS EACH
CAL 309 **FAT** 17G (SAT 3G) **CHOL** 276MG
CARBS 10G **TOTAL SUGARS** 4G (ADDED 0G)
PROTEIN 30G **FIBER** 4G **SODIUM** 605MG
POTASSIUM 604MG

Tip: Look for prepared cauliflower rice (or cauliflower crumbles) with other prepared vegetables in some supermarkets. To make your own, pulse cauliflower florets in a food processor until broken down into rice-size granules. One 1½-pound head of cauliflower yields about 4 cups of cauliflower rice.

Beefless Vegan Tacos

ACTIVE: 20 min **TOTAL:** 20 min
TO MAKE AHEAD: Prepare through Step 1 and refrigerate for up to 3 days.

Take taco night in a new direction with these healthy vegan tacos. We've swapped crumbled tofu for the ground beef, without sacrificing any of the savory seasonings you expect in a taco. You can also use the filling in burritos, bowls and taco salads and to top nachos.

- **1 16-ounce package extra-firm tofu, drained, crumbled and patted dry**
- **2 tablespoons reduced-sodium tamari or soy sauce**
- **1 teaspoon chili powder**
- **½ teaspoon garlic powder**
- **½ teaspoon onion powder**
- **1 tablespoon extra-virgin olive oil**
- **1 ripe avocado**
- **1 tablespoon vegan mayonnaise**
- **1 teaspoon lime juice**
- **Pinch of salt**
- **½ cup fresh salsa or pico de gallo**
- **2 cups shredded iceberg lettuce**
- **8 corn or flour tortillas, warmed**
- **Pickled radishes for garnish**

1. Combine tofu, tamari (or soy sauce), chili powder, garlic powder and onion powder in a medium bowl. Heat oil in a large nonstick skillet over medium-high heat. Add the tofu mixture and cook, stirring occasionally, until nicely browned, 8 to 10 minutes.
2. Meanwhile, mash avocado, mayonnaise, lime juice and salt in a small bowl until smooth.
3. Serve the taco "meat" with the avocado crema, salsa (or pico de gallo) and lettuce in tortillas. Garnish with pickled radishes, if desired.

SERVES 4: 2 TACOS EACH
CAL 360 **FAT** 21G (SAT 3G) **CHOL** 0MG **CARBS** 33G **TOTAL SUGARS** 4G (ADDED 0G) **PROTEIN** 17G **FIBER** 8G **SODIUM** 610MG **POTASSIUM** 553MG

Spinach & Artichoke Dip Pasta

ACTIVE: 20 min **TOTAL:** 20 min
SERVINGS: 4

If you've ever wanted to make a meal out of warm spinach and artichoke dip, this creamy pasta is for you. And here's what's almost as good as the flavor of this comforting dish: the fact that this healthy dinner has less than 400 calories per serving.

- 8 ounces whole-wheat rotini
- 1 5-ounce package baby spinach, coarsely chopped
- 1 tablespoon water
- 4 ounces reduced-fat cream cheese, cut into chunks
- ¾ cup reduced-fat milk
- ½ cup grated Parmesan cheese, plus more for garnish
- 2 teaspoons garlic powder
- ¼ teaspoon ground pepper
- 1 14-ounce can artichoke hearts, rinsed, squeezed dry and chopped *(see Tip)*

1. Bring a large saucepan of water to a boil. Cook pasta according to package directions. Drain.
2. Combine spinach and 1 tablespoon water in a large saucepan over medium heat. Cook, stirring occasionally, until just wilted, about 2 minutes. Transfer to a small bowl. Add cream cheese and milk to the pan; whisk until the cream cheese is melted. Add Parmesan, garlic powder and pepper; cook, whisking until thickened and bubbling.
3. Drain as much liquid as possible from the spinach. Stir the drained spinach into the sauce, along with artichokes and the pasta. Cook until warmed through.

SERVES 4: 1⅓ CUPS EACH
CAL 371 **FAT** 9G (SAT 4G) **CHOL** 26MG
CARBS 56G **TOTAL SUGARS** 6G (ADDED 0G)
PROTEIN 17G **FIBER** 8G **SODIUM** 550MG
POTASSIUM 397MG

Tip: If you can find frozen artichoke hearts, they also work well in this recipe. Thaw before using.

Mediterranean Chickpea Quinoa Bowl

ACTIVE: 20 min **TOTAL:** 20 min
TO MAKE AHEAD: Prepare red pepper sauce (Step 1) and quinoa (Step 2); refrigerate in separate containers. Assemble just before serving.

Quinoa and chickpeas pack this vegetarian grain bowl with plenty of plant-based protein. Whip up a batch of these Mediterranean meals and pack in containers with lids to stash in the fridge for easy, grab & go lunches all week long.

- **1 7-ounce jar roasted red peppers, rinsed**
- **¼ cup slivered almonds**
- **4 tablespoons extra-virgin olive oil, divided**
- **1 small clove garlic, minced**
- **1 teaspoon paprika**
- **½ teaspoon ground cumin**
- **¼ teaspoon crushed red pepper (optional)**
- **2 cups cooked quinoa**
- **¼ cup Kalamata olives, chopped**
- **¼ cup finely chopped red onion**
- **1 15-ounce can chickpeas, rinsed**
- **1 cup diced cucumber**
- **¼ cup crumbled feta cheese**
- **2 tablespoons finely chopped fresh parsley**

1. Place peppers, almonds, 2 tablespoons oil, garlic, paprika, cumin and crushed red pepper (if using) in a mini food processor. Puree until fairly smooth.
2. Combine quinoa, olives, red onion and the remaining 2 tablespoons oil in a medium bowl.
3. To serve, divide the quinoa mixture among 4 bowls and top with equal amounts of the chickpeas, cucumber and the red pepper sauce. Sprinkle with feta and parsley.

SERVES 4: 1½ CUPS EACH
CAL 479 **FAT** 25G (SAT 4G) **CHOL** 8MG **CARBS** 50G **TOTAL SUGARS** 3G (ADDED 0G) **PROTEIN** 13G **FIBER** 8G **SODIUM** 646MG **POTASSIUM** 443MG

Skillet Steak with Mushroom Sauce

ACTIVE: 20 min **TOTAL:** 25 min

This one-skillet meal will be on your table before you know it. The pan drippings combine with mushroom, broth and grainy mustard to make a thick and delicious sauce.

- 12 ounces boneless beef top sirloin steak, cut 1-inch thick and trimmed
- 2 teaspoons salt-free steak grilling seasoning, such as Mrs. Dash
- 2 teaspoons canola oil
- 6 ounces broccoli rabe, trimmed
- 2 cups frozen peas
- 3 cups sliced fresh mushrooms
- 1 cup unsalted beef broth
- 1 tablespoon whole-grain mustard
- 2 teaspoons cornstarch
- ¼ teaspoon salt

1. Preheat oven to 350°F.

2. Sprinkle meat with steak seasoning. Heat oil in a 12-inch cast-iron skillet over medium-high. Add meat and broccoli rabe. Cook, turning the broccoli rabe once (do not turn the meat), for 4 minutes. Place peas around the meat.

3. Transfer the skillet to the oven and bake until meat is medium-rare (145°F), about 8 minutes. Transfer the meat and vegetables to a platter; cover and keep warm.

4. To prepare sauce: Add mushrooms to the drippings in the skillet. Cook over medium-high, stirring occasionally, for 3 minutes. Whisk broth, mustard, cornstarch and salt; stir into mushrooms. Cook and stir until thick and bubbly. Cook and stir 1 minute more. Serve the meat and vegetables with the sauce.

SERVES 4: 2½ OZ. MEAT & ⅓ CUP SAUCE EACH
CAL 226 **FAT** 6G (SAT 3G) **CHOL** 51MG **CARBS** 16G **TOTAL SUGARS** 6G (ADDED 0G) **PROTEIN** 27G **FIBER** 5G **SODIUM** 356MG **POTASSIUM** 780MG

Easy Italian Wedding Soup

ACTIVE: 20 min **TOTAL:** 20 min

Forget the marble-size meatballs you find in many versions of this soup. In this easy recipe, they're full-size and plenty filling.

- **4 tablespoons extra-virgin olive oil, divided**
- **1⅓ cups chopped yellow onion**
- **⅔ cup chopped carrot**
- **⅔ cup chopped celery**
- **2 tablespoons minced garlic**
- **6 cups unsalted chicken broth**
- **6 ounces orzo, preferably whole-wheat**
- **1½ tablespoons chopped fresh oregano**
- **½ teaspoon kosher salt**
- **24 cooked chicken meatballs (12 ounces), such as Easy Italian Chicken Meatballs *(recipe on EatingWell.com)***
- **4 cups baby spinach**
- **¼ cup grated Parmesan cheese**

1. Heat 1 tablespoon oil in a large pot over medium-high heat. Add onion, carrot, celery and garlic; cook, stirring occasionally, until the onion is translucent, 4 to 5 minutes. Add broth, cover and bring to a boil. Add orzo, oregano and salt; cover and cook, stirring occasionally, until the orzo is just tender, about 9 minutes.

2. Stir in meatballs and spinach; cook until the meatballs are heated through and the spinach is wilted, 2 to 4 minutes. Serve sprinkled with cheese and drizzled with the remaining 3 tablespoons oil.

SERVES 6: 1½ CUPS EACH
CAL 415 **FAT** 19G (SAT 5G) **CHOL** 101MG **CARBS** 36G **TOTAL SUGARS** 5G (ADDED 0G) **PROTEIN** 26G **FIBER** 4G **SODIUM** 728MG **POTASSIUM** 681MG

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P. 61 Jochen Tack/Alamy (2)
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PP. 66–67 Leigh Beisch
P. 68 Carson Downing
PP. 69–70 Blaine Moats (2)
P. 71 Photo by Karla Conrad; Food Styling by Kelsey Bulat; Prop Styling by Sue Mitchell
P. 72 Jennifer Causey
PP. 73–74 Carson Downing (2)
P. 75 Jennifer Causey
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P. 91 Blaine Moats
P. 92 Devon O'Brien
P. 93 Marty Baldwin
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Eat Smart, Stay Sharp

Brain food is very real, helping to shape your ability to remember simple things, like where you put your darn keys, as well as fighting serious memory-related disorders. Texas-based researchers found that falling short on vitamin D (as most of us do) was linked to a 25% increased risk of cognitive impairment in older adults. Up your vitamin D with fortified dairy, fatty fish and certain mushrooms, including morel, oyster and maitake. And ask your doctor about a supplement to help you get to the recommended daily 600 to 800 IU (depending on age and gender). *—Leslie Goldman*

Healthy for Life

A nutritious diet and an active lifestyle play a large part in keeping you youthful, and they can also help prevent chronic diseases. Understanding new research is a path to aging healthfully and feeling good inside and out.